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JULY 3, 1920

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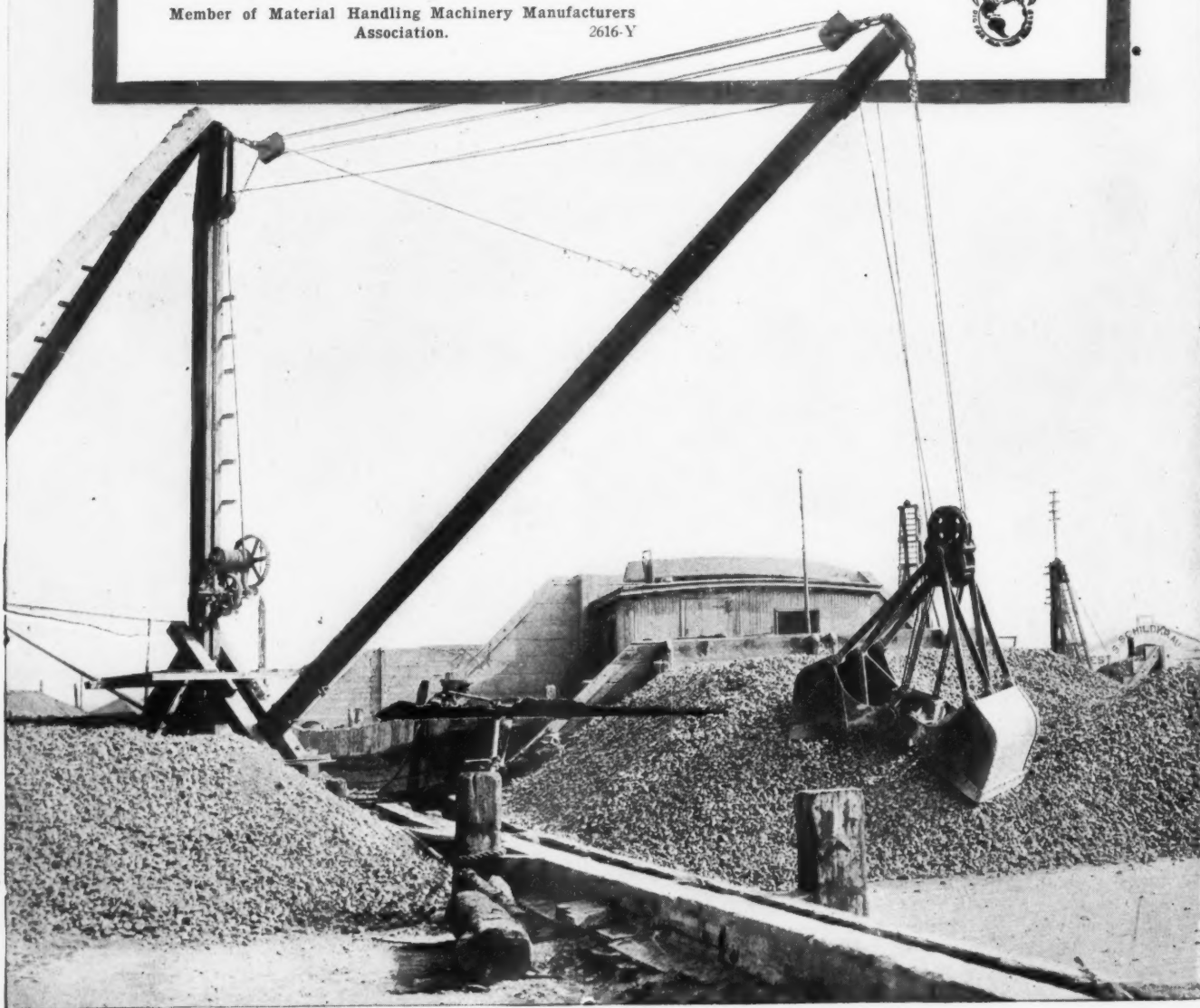
The bucket shown in the photograph is of the rope reeved type operating in the bight of the line, which practically doubles the load capacity of the hoisting unit. Many other types of buckets are, however, available.

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Vol. 49

FLORAL PARK, JULY 3, 1920

No. 1

New Water Supply Works of Winnipeg*

By James H. Fuertes, Consulting Eng.

Brief history of Winnipeg Water Works. Description of new supply and of country traversed by the long concrete gravity aqueduct. Unusual intake conditions and special design thereby necessitated for intake.

Winnipeg is situated about 65 miles north of the international boundary, and about 35 miles south of the southern end of Lake Winnipeg, at the junction of the Red river, which rises in Minnesota and follows a northerly course, and the Assiniboine river joining it from the west, the combined waters continuing north to an outlet into Lake Winnipeg.

The city, prior to its organization as a town, was merely a small settlement or trading post, called Fort Garry, at the junction of these two rivers. In 1874 the population of Winnipeg is given as 1869; by 1890 it had jumped to 23,000; by 1910 to 132,720, and by 1913 to 215,000; the present population is estimated to be 250,000.†

The new water works of Winnipeg, forming the subject of this paper, were built to provide a satisfactorily large supply of soft water. Before the construction of these new works the city depended upon a ground water supply of very hard water, unfit, without softening, for manufacturing or commercial uses, and too limited in quantity even for domestic use. Under such conditions the establish-

ment at Winnipeg of manufacturing or industrial works requiring a plentiful supply of suitable water was out of the question and a great handicap to the proper development of her otherwise excellent resources as a trade center. The question of changing the water supply had been agitated annually for a number of years, but the inevitable expense involved in going a great distance to secure a new supply necessitated the postponement of active steps in that direction a number of times.

Prior to 1880 the municipal water supply of Winnipeg was obtained from wells scattered about the town and distributed to the consumers from tanks and barrels on carts in the summer, or sleds in the winter. In 1882 the Winnipeg Water Works Company, operating under an exclusive twenty-year franchise, built a water works plant on the Assiniboine river on Armstrong point, establishing a pumping station and mechanical filter plant of the pressure type, the filtered water being pumped directly into the city's street mains. This system was purchased by the city in April, 1899, for a little over a quarter of a million dollars, but was abandoned in 1905 following the introduction of a ground water supply.

* Presented at the Montreal convention of the American Waterworks Association.

† Entire Greater Winnipeg Water District.



GRAVITY CONDUIT UNDER CONSTRUCTION, AND GENERAL VIEW OF COUNTRY TRAVERSED

The quality of the water purveyed from the Assiniboine plant was not satisfactory, nor was the ground water supply, both being very hard. Agitation in favor of a new and better supply was kept up more or less continuously from that time until the commencement of the building of the present new supply.

In March, 1883, Dr. Agnew in a letter to the Free Press, directed attention to the Lake of the Woods as a source to which Winnipeg must ultimately look for her water supply, and again elaborated upon this source in February, 1884, in an address before the Manitoba Historical and Scientific Society. In February, 1895, Walter Moberley, C. E., made a report to the City Council advocating a new supply from the Winnipeg river. Nothing was done with either suggestion, however, and in October, 1896, Col. H. N. Ruttan, city engineer, reported on the relative merits of a supply from the Assiniboine river and a supply from artesian wells.

The well supply was developed quite extensively; the water, however, while agreeable to the taste and excellent as to appearance, was too hard for ordinary municipal purposes and in September, 1897, Rudolph Hering was asked to report upon the possibility of softening this water and on the merits of other available sources of supply. Mr. Hering examined and reported on a ground supply from Poplar Springs, a pumped supply from the Assiniboine river, a pumped supply from Winnipeg river, and on the extension and softening of the artesian well supply, recommending that the softened ground water supply be adopted and further developed.

About 1905, the city having been much depleted, so far as local sources were concerned, another examination was made and reported on to Councils in 1907 by Messrs. Fuertes, Lea, Schwitzer and Whipple, who investigated the possibilities of extending the ground water supply, securing a supply from the Red river and the Assiniboine river, as well as supplies from the Winnipeg river, and from the Lake of the Woods. This report favored developing a supply from Winnipeg river as being less expensive than a supply from the Lake of the Woods, while being equally satisfactory, after proper treatment.

Following this report another investigation was made by Prof. C. S. Schlichter for Public Utility

Commissioner H. A. Robson, favoring a supply from the Lake of the Woods, or Shoal Lake.

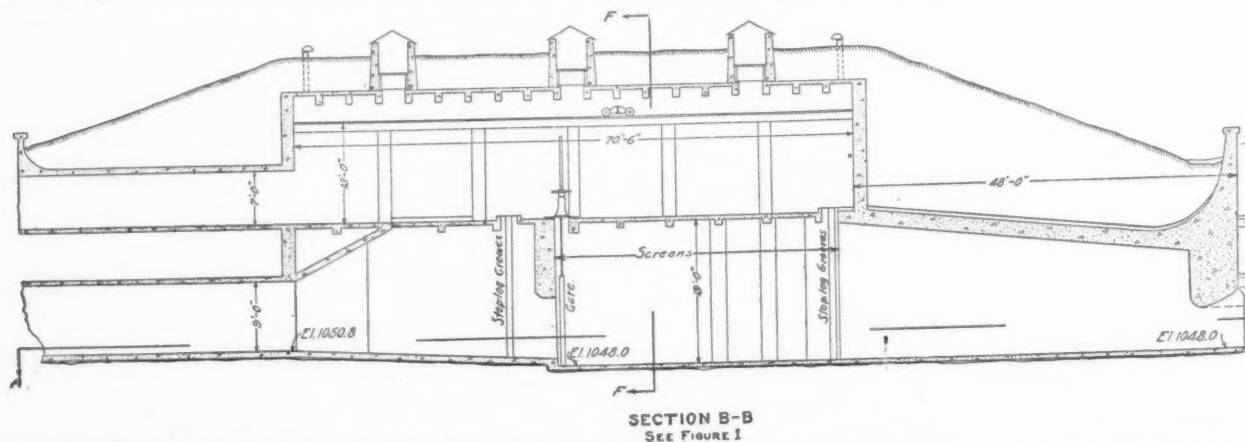
In the following year, 1913, the question of the desirability and availability of the Shoal Lake Supply was again referred to a commission of engineers, composed of Dr. Rudolph Hering, Frederick P. Stearns and James H. Fuertes, who, after considering the possibilities of a gravity supply to Winnipeg from the Lake of the Woods, through a concrete aqueduct, concluded that works could be built of much larger capacity than had heretofore been considered for a sum which would not be too difficult for the district to provide. The report was adopted by the officials of the Greater Winnipeg Water District on September 6, 1913. On the 20th of the same month five field parties were on the ground making the preliminary surveys for the alignment.

THE NEW SUPPLY

Organization: Since Shoal Lake waters are tributary to the waters of the Lake of the Woods, a portion of which crosses the international boundary into the United States, it was necessary to secure for the project the approval of the International Joint Commission having jurisdiction over boundary waters; and as the boundary line between the provinces of Manitoba and Ontario passed through Indian bay, a tributary of Shoal lake, it was necessary also to secure the consent of the Ontario government to the taking of these waters.

The Greater Winnipeg Water District was organized and constituted by proclamation of the lieutenant-governor of Manitoba June 10, 1913. The Water District was authorized to go outside of Manitoba for water by the Dominion Parliament in Act 3-4, George V., Chapter 208, and on October 2, 1913, an order in Council of the Province of Ontario was passed permitting the use of water for the Winnipeg Water District from Shoal Lake up to a limit of 100 million gallons per day. The International Joint Commission approved the application January 15, 1914.

All difficulties in regard to the securing of the water having been settled, surveys and investigations were immediately started and by the end of February, 1914, the location was completed, there having been involved the taking of 380 square miles of topography, 362 miles of transit lines, 1,317



LONGITUDINAL SECTION OF INDIAN BAY INTAKE SHOWING OPERATING ROOM ABOVE SCREEN CHAMBER AND CONDUIT

miles of levels, 95 miles of precise levels, 11,544 feet of soundings in Indian bay, and 3,897 feet of test borings along the line of aqueduct.

The work of clearing the right of way was started in March, 1914, and finished in about three months, the standard width of the right of way being 300 feet, greater widths were secured where necessary. The first actual construction work was the erection of the telephone line, 91 miles long, which was begun May 5, 1914, and cost about \$32,500. In October, 1914, contracts were awarded for the whole aqueduct from Deacon to Shoal lake, and the first water was turned through the completed aqueduct and discharged into the McPhillips street reservoir in Winnipeg on March 26, 1919.

Following receipt of this report and its adoption by the city of Winnipeg and six other smaller neighboring municipalities which, with Winnipeg, had organized under the law of the Dominion and the provinces as "The Greater Winnipeg Water District" and the appointment of the commissioners, the engineers and the necessary staff prepared the way for actively prosecuting the establishment of the new supply.

COUNTRY TRAVERSED BY THE AQUEDUCT

It was found, from studies and inspection, that the line proposed in the Hering-Stearns-Fuertes report (which was based partly upon surveys made specially for this report and partly upon interpolated profiles based upon the profiles of the Canadian Pacific and Grand Trunk Railways) was a practicable line but that a more intimate knowledge of the country either side of this line gave promise of securing a more economical aqueduct than that following the line proposed.

Throughout the whole length of the line the country is very flat and was largely covered with swamps, timber and underbrush. Only in a few places was it possible to see off to any distance from the line, and actual elevations had to be taken along the section lines, or wherever clearings had been cut out, for a distance, sometimes, as much as ten miles either side of the line, in order to avoid running into impracticable country on the one hand, and in order to be able to pick out a better alignment on the other hand.

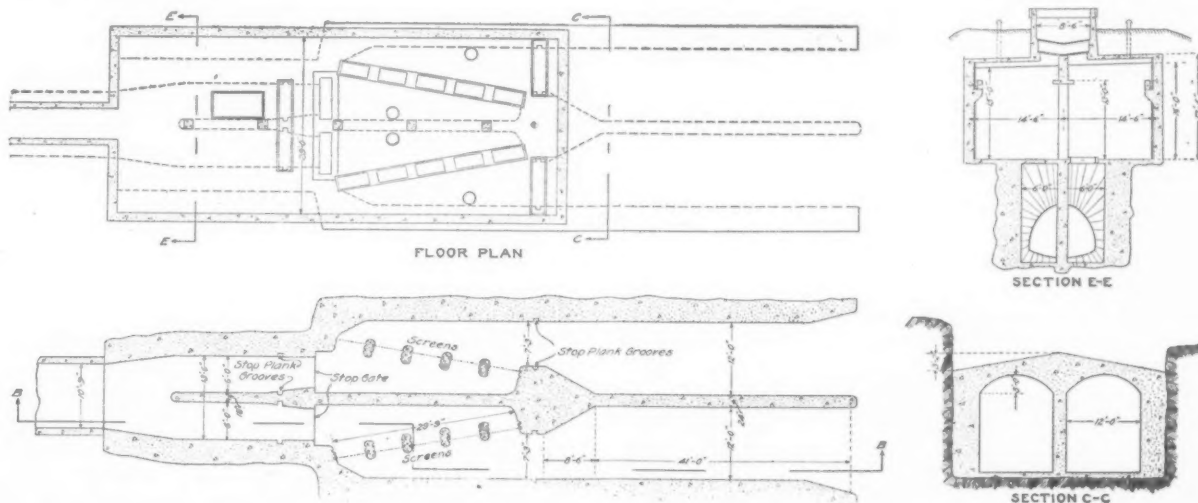
For about twenty miles eastward from Winnipeg the plains, formed by the deposition of clays from suspension in the sea water of the ancient glacial Lake Agassiz, have a slope of but one to three feet to the mile. To the eastward of this plain the country rises somewhat more rapidly for a few miles. Large deposits of gravel occur in ridges along what were, in ancient times, progressive shore lines of this inland sea as the continental ice-cap receded. Where the shore line followed along the contour of the ground, the glacial deposits were washed out, leaving the sand and gravel comparatively clean and free from clay. Going still further east and, in fact, located more or less along the whole length of the aqueduct, the soil is a mixture of clay, sand and gravel, sometimes stratified and sometimes mixed, on top of which has grown up successive generations of vegetation forming what are locally termed "muskegs."

The sub-soil throughout the whole distance is practically water-tight, and consequently the run-off of rain and melting snow, which amount together to only about 22 inches from the watershed in a year, is retarded so greatly that but three open streams are crossed by the aqueduct in the nearly 100 miles between Shoal lake and the Seine river, which joins Red river at Winnipeg.

SOURCE OF SUPPLY

The report of Hering, Stearns and Fuertes recommended securing the water from Indian bay, that portion of the Lake of the Woods nearest to Winnipeg. Indian bay is an arm of Shoal lake, and Shoal lake, which has a water area of 110 square miles, is connected with the main Lake of the Woods by means of a narrow channel called "Ash Rapids." While the watershed of Shoal Lake, 360 square miles, is not large enough to maintain in very dry years a yield of 85 million gallons a day, this yield can be had by drawing through it on the main body of water in the Lake of the Woods without appreciably affecting the water level of the main lake. The fluctuation in level between low and high water in Indian bay or Shoal lake lies between elevations 1059.6 and 1065.0 above sea level.

Indian bay, from which the water is taken, is



FROST PROOF INDIAN BAY INTAKE BUILT BELOW ICE LEVEL IN WATER 22 FEET DEEP

about 6 miles long and from one to three miles wide. Numbers of soundings lengthwise and crosswise of this lake show its depth to vary from 24 to 26 feet over the whole bottom excepting in the immediate vicinity of the shores, which shoal up more or less rapidly.

At the western end of Indian bay a stream known as Falcon river enters and discharges highly colored water from swamps lying to the northwest of Indian bay. Just to the south of and parallel with Indian bay lies Snowshoe bay, a promontory varying from one-half a mile to a mile or more in width and with a length of about six miles separating Snowshoe bay from Indian bay. Both Snowshoe and Indian bays connect openly with Shoal lake at the eastern end of the promontory above mentioned.

DECOLORIZATION

The waters of all the bays tributary to Lake of the Woods are more or less highly colored, being fed by small streams having their origin in the swamps and muskegs bordering the main lake. The color of the water of Shoal lake and of the main Lake of the Woods, away from the influence of these small, highly colored streams and where time and the bleaching action of sunlight have had an opportunity to bring about discolorization, is not high enough to be objectionable for ordinary municipal uses. Indian bay, when first examined, was decidedly discolored throughout its whole area, the greater part of the discolorization coming from Falcon river.

A study of the topography of the promontory lying between Snowshoe and Indian bays disclosed a low area through which a canal could be cut at small expense, to connect the two lakes; which suggested the plan, subsequently adopted, of diverting the black water of Snake Lake and Falcon river through this canal into Snowshoe bay by the building of a dyke across the shallow water at the west end of Indian bay.

The cost of this dyke and canal, which secured an intake point from which low colored water could be had in Indian bay, was about \$147,000. To extend this aqueduct 5 miles further to Shoal lake, the only other alternative to secure satisfactory water, would have cost about \$1,000,000.

The results have been quite satisfactory, as may be seen from the statement that on June 7, 1915 (the diversion dyke having been completed in 1914), the color of the water on the Falcon river side of the dyke across the end of Indian bay was 107, while the color on the Indian bay side of the dyke on the same day was 9 (platinum cobalt scale).

The natural color of the water in Indian bay is lower in the winter than in the summer; under the ice the color remains practically constant during the entire winter. During the winter of 1919-1920 the color at the intake remained at 12.

The bottom of Indian bay is more or less covered with accumulations of leaves, shells of infusoria, dead leaves, grasses and other matters of organic and mineral origin, generally reduced by time and natural agencies to a stable or non-putrescible condition. In addition the waters contain

numbers of algae and living organisms of various kinds.

The lake being comparatively shallow, the waters experience two distinct turn-overs each year, due to the changes in temperature above and below the temperature of maximum density. Ice forms on the lake to a thickness of about 4 feet, and the temperature of the water drops to about 34 degrees at the bottom of the lake in very long-continued cold weather.

When water at the surface of the lake, on the approach of cold weather, reaches a temperature of 39 degrees, it tends to sink to the bottom of the lake and displace the warmer and lighter water underneath. This continues until the water of the entire lake has reached a graded temperature such that the heaviest remains at the bottom and the lightest at the top. In the following spring, when the surface water again warms up, the warmth being transmitted gradually to the lower strata, as soon as that at the surface reaches a temperature of 39 degrees it sinks, as before, displacing the colder water beneath, and a gradual readjustment of the entire mass takes place.

There are thus two distinct periods when bottom water will be brought to the surface and with each over-turning, of course, some of the matters which have settled to the bottom will be caught in the rising currents and brought up to the surface. This phenomenon is one which requires watching for many reasons, one of which was discovered during the first year of operation of the new works. On the occasion referred to such large quantities of grasses and weeds were brought up during the over-turn that the intake screens, before thought was given the matter by the local attendant, became clogged sufficiently to cause a head of several inches on the screens, with the consequent breaking out of the wire mesh, permitting dirty water and fish to pass into the aqueduct.

BASIS OF DESIGNS FOR WORKS

DESIGN OF INTAKE

The design of the lake intake was studied out with a view to preventing trouble that might interrupt the supply of water to the city. These troubles, it was anticipated, would be due largely to ice in the extremely cold winter weather. It was planned, therefore, to allow for an ice sheet 4 feet thick on the lake and to have a passage beneath this sufficiently wide and deep to admit the water into the intake with as little loss of head as possible and without drawing in spicules of ice forming on the under side of the ice sheet.

The general plan was to extend in front of the gate house two rock-ballasted earthen dykes with the side slopes of 1 on 3, in parallel lines cut from the shore 200 feet to where the water was about 22 feet deep at high water, the dykes being 180 feet apart on their center lines. The space between these dykes was dredged out and the whole area covered with screened gravel, bringing the finished surface up to elevation 1048, or about 13 feet below mean lake level.

The front wall of the concrete gate house was carried down to a depth of 8.7 feet below average

lake level, or 6.25 feet below low water, in order to cut off the entrance of cold air into the screen chamber through the intake, and in order to prevent the formation of ice in the intake structure.

The screen chamber itself was simply an extension of the aqueduct with its bottom widened and its sides made vertical. This chamber was divided into two parts by a longitudinal partition, and two sets of screens were placed within in such a way as to offer a large area to the moving water and permit of removal for cleaning. The whole screen house was covered with an earth embankment four feet deep for frost-proofing, so that ice would not form on the fine mesh screens and retard the passage of the water.

Air temperatures as low as 50 degrees below zero are not infrequent at the intake and commonly temperatures of zero and lower prevail continuously from the beginning of December until the end of March. Frost, therefore, was a matter to be reckoned with in the design for these works. The general arrangement of the intake structure is shown in Figures 1 and 2.

The screens had a total submerged area at high water of about 700 square feet, which, for a water consumption of 100 million gallons per day, would

correspond with 7 square feet per million gallons per day. The screens were of copper wire cloth, having $\frac{3}{8}$ -inch mesh backed by a screen with 1-inch meshes.

After the accident of the breaking through of the screens last summer, an additional set of vertical steel racks with $1\frac{1}{2}$ -inch spacing was installed just below the upper stop-log slot; a second set of screens with six meshes to the inch was also installed in connection with the coarser screen to guard against a possible repetition of that unfortunate and unpleasant experience. The three barriers have been successful in excluding undesirable water-borne life.

The screens are lifted for cleaning by a chain hoist running on overhead tracks. Inside of the screen house, but below the screens, there is a boat entrance to permit the dropping of a boat into the aqueduct for the purposes of inspection from the lake to the inverted siphon at the venturi meter under Falcon river. Another boat entrance is placed just beyond Falcon river to permit of inspection from Falcon river to Birch river, and again, at the beginning and end of each of the inverted siphons to the end of the arched section 5 miles east of Deacon.

The American Water Works Association Convention

Narrative of the fortieth annual convention of the Association, held at Montreal, Canada. Some slight changes were made in the constitution, a few new committees appointed and Cleveland selected for the next convention.

The papers were read and discussed practically as provided by the program.

The exhibit was an unusually attractive one.

About 450 members of the American Water Works Association, accompanied by an unusual number of ladies as guests, attended the fortieth annual convention of the American Water Works Association at Montreal during the week of June 21 to 26. Even the rainy weather which was continuous during the first two days of the week did not prevent the convention from being a most enjoyable one, and all of the members retained the spirit of optimism which was illustrated by Secretary Diven when he said (during the trip down the Lachine Rapids) that it was fortunate it was raining, because the glare of sun on the water would have prevented a good view of the rapids.

The exhibit was an unusually complete and attractive one, and the lay-out was such that not only did one have to pass through the exhibit hall to reach the convention hall, but until he had familiarized himself with the route he was likely to wander past most of the exhibits before he could find where the literary part of the convention was being staged.

There was just enough of the non-technical en-

tertainment to relieve the long tedium of listening to and discussing papers, the diversions consisting of a trip through the rapids and a smoker. The ladies also were well taken care of, although the rain interfered to some extent with the program for their entertainment. In all respects the convention was very well planned and the plans carried out most effectively.

The program of the convention meeting was followed very nearly as planned and printed (with the customary exception that the sessions were all late in beginning). A few papers which had been scheduled were not present, and on the other hand, there were two or three which had come in after the program was made up. Superintendent's day gave opportunity for a series of general and very interesting discussions and formed a most enjoyable conclusion to the sessions of the convention. During the morning and afternoon discussions of this day in the main audience room, the Chemical and Bacteriological Section was holding sessions in an adjoining room, from which they emerged to join the main body of the society in watching a

most interesting set of moving pictures showing the formation of frazil and anchor ice and listening to a paper on the subject of the formation and prevention of such ice.

In addition to the trip through the rapids and the smoker, many of the members found time for golf and some for a view of the city from an airplane. On Friday a number visited the Montreal Water Works plant in a specially conducted party, a few having visited the plant individually on previous days.

The business of the convention consisted in the selecting of members of the Nominating Committee from the several districts, the selection of the place for the next convention, and the adoption of amendments to the constitution. The first amendment had to do with the nominating of officers, the change being only in the detail that the Nominating Committee should be selected during the first day of the convention. This would permit the Nominating Committee to meet without the cost to the Society of their traveling expenses (amounting to about \$500) in order to reach a common meeting place or the inconvenience to the members of the Nominating Committee required by attending such meeting. The amendment makes Article VI, Section 4, read as follows

"At the last order of business of the second session of the first day of the annual convention, the members of each district shall elect a member of the Nominating Committee to represent their respective districts. Due notice of such election shall be prominently given in the program of the convention (except in the year 1920) which shall be mailed to the members at least three weeks previous to the opening date of the convention. The votes of the districts shall be by ballot or acclaim, and a majority vote of the members of each district present and voting shall elect the member of the Nominating Committee to represent that district. The members of the Nominating Committee so elected, together with the last past president at the convention, who shall be chairman, shall constitute the nominating Committee to place in nomination candidates for the offices to be filled for the ensuing year."

Article VI, Section 5, was amended to read:

"The Nominating Committee shall hold a meeting at 8:30 A. M. on the second day of the convention; previous to which time suggestions of names to fill the various offices may be made by members of the association to the members of the Nominating Committee, or by leaving same with the secretary of the association prior to the meeting of the committee; names sent to the secretary by mail at any time prior to the meeting of the committee shall also be presented to the committee for consideration. Nominations shall be by majority vote of the Nominating Committee, who must place in nomination one, and may place two, candidates for each office to be filled. The nominations so named by the Nominating Committee shall be announced at the next session of the convention, and also be prominently posted in the convention hall, the secretary's office and the exhibit room of the convention."

After discussion of a proposal to change the method of presentation of making additional nominations by members of the association, this procedure was left as already provided for in the Constitution.

This method of selecting a Nominating Committee and having the nominations made and presented to the society was carried out at this convention. On Tuesday afternoon the several sections collected in groups in different parts of the hall and chose the following members of the Nominating Committee: First District, T. J. Lafrenière, of Montreal;

Second District, George C. Andrews, of Buffalo; Third District, Herman Rosenstreter, of Newark; Fourth District, H. E. Keeler, of Chicago; Fifth District, E. L. Fulkerson, of Waco, Texas; Sixth District, Thomas Maloney, of Council Bluffs. On Thursday morning this committee presented its report, nominating as follows: for President, Dr. Edward Bartow; for Vice-president, W. S. Kramer; for Treasurer, Wm. W. Brush; for Trustee of the Third District, G. C. Bensheimer, and of the Sixth District, J. Chris. Jensen.

Officers for the year 1920-1921 were announced at the first session, the letter ballot having resulted in the election of Beekman C. Little as president, with 467 votes to 314 for M. L. Worrell; Edward Bartow for vice-president, with 448 votes to W. S. Kramer's 320 votes; James M. Caird for treasurer, with 416 votes to 351 votes for J. W. Ackerman; and the two trustees, Harry F. Huy and Robert J. Harding, for whose positions there was no contest.

The Convention Committee reported, recommending that the next convention be held at Cleveland, with Baltimore as second choice, invitations also having been extended from Kansas City. The members then balloted with the result that Cleveland received 87 votes, Kansas City 70 and Baltimore 49. Following the ordinary custom of eliminating all but the two highest, a second ballot resulted in the selection of Cleveland.

The Finance Committee reported a balance of cash in the bank of \$1603, and \$200 in bonds, together with a permanent investment fund having a par value of \$12,000. Six hundred and sixty-seven dollars had been received in interest and \$12,939 from dues and other income received through the secretary. The expenditures were kept within the budget allowance with the exception of two items, which, together, exceeded their allowance by \$55. Considering the considerable increase in all costs during the year, this would seem to be a very creditable showing.

The expenditures were, however, greater than the income, and to avoid depleting the reserve, it seemed desirable to increase the dues of the society. The Executive Committee recommended that the dues of members be increased from \$5 to \$6, those of corporate members to \$10, and associates to \$15. Some members thought that the dues for active members should be increased to \$7 rather than to \$6. As the increase in dues requires a constitutional amendment, it was voted that the secretary send a questionnaire to the entire membership in order that the Executive Committee may be informed as to the opinions of the members on this point, in order that they may recommend the adoption next year of a constitutional amendment should such be generally approved by the members.

Another amendment to the constitution was suggested to the Executive Committee and reported without their approval, which would provide for the return of the society to the custom of electing the secretary rather than have him appointed by the Executive Committee. This was voted down, called up at a later session for consideration, and, after considerable discussion and some unfortunate clashes of opinion and charges against certain of-

ficials, was finally disposed of without any change being made in the Constitution in this respect.

PAPERS AND DISCUSSIONS

TUESDAY SESSION

At the opening of the sessions of the convention on Tuesday morning the president announced the appointment of Messrs. Liesen, Kramer and Wood as a committee on resolutions. He also announced the death during the year of Mr. Brown, who had served as stenographer at the conventions of the association for many years past and who was acquainted with most of the regular attendants at these conventions.

The president then read his annual address, suggesting that in the future this practice of requiring the president to deliver an annual address be dispensed with. The point given special prominence by President Davis was the importance of the "sections" of the association. He believed that the American Water Works Association should be truly representative of water works officials and matters in all sections of the country, and believed that this could be brought about only by having sections scattered throughout this entire area, sufficient to develop and crystallize local interests. Where there are now no sections, or the sections cover too large a territory, it may be possible to affiliate existing organizations with the association, or it may be preferable to organize new sections. This, he believes, would result not in a weakening of the central body, but in a strengthening of the ranks of the water works men through the central body and an increase in the benefits derived by them from the organization by means of the local sections. Mr. Davis also made a plea for much greater activity of this society in the development and promulgation of standards for the various supplies and methods employed by water works men. The society's standard specifications for cast iron pipe are now in general use and there would seem to be no reason why other standards might not prove equally successful and be accepted by both water works departments and manufacturers.

Following the president's address, the works of the Montreal Water and Power Company, which supplies a large part of the area of the city of Montreal which has been added in recent years to the original area of the old city, was described by F. H. Pitcher. Thomas W. Lesage then described the municipal water supply of the city, which supplies the old section and some parts of the more recent additions.

Following a two-hour recess for lunch, the water supply problems of the Province of Quebec were described by T. J. Lafrenière, sanitary engineer of the Province of Quebec. Mr. Lafrenière stated that Quebec has a law modeled more or less closely on the Bense Law of Ohio, but which has not had to withstand the legal attacks that have been encountered by the Ohio Board of Health. The Board of Health of the Province does not believe in compelling cities to treat sewage (presumably in case only that a nuisance is not created). Judging from their action in one important case, they will require water works corporations to purify the

water supplied by them to the public in cases where such water was safe when their plants were built, but which has been rendered dangerous by later developments, only when the cities will reimburse the company for the expense of such purification either by permitting the rates to be increased or by paying the company outright for the construction of the purification plant.

James O. Meadows described Montreal's experience in the manufacture of alum. The method employed was practically the Hoover method used by cities in the United States. As good purification results were obtained with the alum secured by this Hoover method as by use of the more pure commercial product, and there was a saving of fully 50 per cent in the cost of alum purchased from private manufacturers.

The evening session opened with Beekman C. Little's paper entitled, "Water Works Experiences," in which the president-elect combined amusement, interest and instruction to the members present. Two papers illustrated by lantern slides were presented, one by Leonard A. Day entitled, "Economic Features of Pumping Station Operation"; the other by James B. Wilson entitled, "Difficulties in Building the Louisville Pumping Station." Mr. Day described in detail how the municipal pumping plants at St. Louis were enabled to save a very appreciable percentage of their coal consumption by modifications in the boiler plants, chiefly in the construction of the grate arches, etc.

Mr. Wilson described the difficulties encountered in sinking the foundations for the Louisville pumping station and the methods employed in overcoming them.

WEDNESDAY SESSION

Wednesday morning was occupied with a trip through the Rapids, which was taken by practically the entire attendance at the convention, and in the evening was the smoker given by the Water Works Manufacturers' Association, leaving only the afternoon for papers and discussions.

The first of these was a double paper on the new water supply of Winnipeg, a presentation of the conditions and the development of the plans being given by James H. Fuertes and a discussion of the construction by William G. Chase. Mr. Fuertes' portion of the discussion is given in another part of this issue. Both of the papers were very interesting, describing a project costing more than \$15,000,000, and were well illustrated with lantern slides.

Reports from the several sections were then called for and George C. Habermeyer reported for the Illinois Section, W. A. Judd for the Iowa Section and F. W. Cappelen for the Minnesota Section. All reported very encouraging activity and interest by the members of the several sections. During the convention the Canadian Section was organized, starting off with a very encouraging number of members, in view of which it was given the cup which is won each year by the section securing the largest percentage of increase in members. This cup had been held for three years in succession by the Minnesota Section, and according to the rules

under which it had been given to the Society, could have been held by this section permanently; but in view of the fact that last year most of the sections lost members instead of gaining them on account of the war, the Minnesota Section, like good sports, yielded their claim to the permanent possession of the cup.

These reports were followed by the reports of the Finance Committee, which has already been referred to. The report of the Committee on electrolysis was presented by E. E. Minor. The committee recommended that the society endorse the practice of grounding secondaries of electric transformers to water pipes, because it would add greatly to safety from accidents due to electricity, while being in no way injurious to the water pipes. This was referred to the Executive Committee which, on Thursday morning, reported its approval of the suggestion. It was reported that Professor Ganz had stated that he knew of no objectionable results which had followed or were likely to follow from the practice and the Board of Fire Underwriters offered no objection thereto, and the approval of the society was therefore voted by the convention.

On motion of George A. Johnson, amended by John H. Gregory, it was voted to appoint a Committee on Standards, to cooperate with the American Standards Association, to prepare standards for bacterial analysis, coal, oil, chemicals, cement and other materials used by water departments, standards of purity for water for both domestic and industrial use, and standards for filtration plants and other parts of water works systems. This action was taken while the tellers were counting the ballots for the next place of meeting, the result of which has already been given.

(To be continued)

Delaware Highway Construction

At a conference held June 21, 1920, between chief engineer Charles M. Upham and chairman John G. Townsend of the Delaware State Highway Department, it was decided that it would be very inopportune to retard the procedure of the 1920 program.

The original program consisted of approximately eighty miles of concrete highway. Only about half of this has been placed under construction. After carefully considering the present situation, it seemed somewhat doubtful about placing any more concrete highways under construction on account of the lack of cement shipment. No difficulty has been experienced in securing asphalt and stone shipments. Therefore, it was agreed that the program should not be held up, but that the highway should consist of a bituminous foundation and asphalt wearing surface. Plans are now being completed, and proposals will be called some time about the middle of August. There will be approximately forty miles of road in this experiment. A smaller experiment consisting of approximately fifteen miles of asphalt surface road was tried out in Sussex county, Delaware, and the results proved very gratifying to the users of these highways.

It was hoped that the main system of the State could be constructed of concrete or concrete foun-

ation, but the demand for the completed roads and the condition of cement shipments have made it necessary to consider asphalt construction.

Immigration Bill 14196

House Bill 14196, prepared by the National Committee for Constructive Immigration Legislation, has been referred to the Committee on Immigration and Naturalization for consideration during the Congressional recess.

The bill was framed with the intent to avoid both complete suspension of immigration and free immigration. Its provisions are based on justice and good will as well as on economic and political considerations, and on the principles that American standards of living must be protected, that only so many shall be admitted as can be steadily employed and that steps must be taken to promote the rapid and genuine transformation of aliens into American citizens.

The bill creates an Immigration Board of six, five of whom are members of the president's cabinet. The board is to have the power to determine yearly the maximum number of immigrants of each people and nation to be admitted. The decision of the board shall be based upon:

1. The demonstrated assimilability of each people as shown by naturalization statistics.
2. Labor conditions in the United States.
3. Maintenance of American standards of living.
4. The fitness and availability of each people for general localities.

The board is required to study and report upon the question of distribution of immigrants.

Distinction is made between transients and immigrants.

Standards of naturalization are raised and the privilege of citizenship is offered to *every* one who will duly qualify.

Laws now existing that contravene our treaties, that discriminate between peoples and that are in conflict with the above provisions are repealed.

The proposed legislation would do away with the discrimination now in force against Chinese and Japanese and put them on the same immigration and naturalization basis that other peoples occupy under the law.

John H. Norris

John H. Norris, for many years chief engineer of the National Meter Company, died very suddenly at his residence in New York City, on June 21st.

Mr. Norris was a man well known to water works officials throughout the country, and was a recognized authority on water meter problems of all sorts, which he handled with invariable patience and success. He was associated with the National Meter Company for over thirty years.

He was unassuming, quiet and dignified at all times, and ever ready with a kind word or act for associates and acquaintances. His unexpected death at the height of his usefulness leaves a vacancy that it will be difficult to fill.

Mechanical Equipment for Highway Construction

By K. H. TALBOT†

Unloading aggregates from railroad cars by hand, bucket elevators, derricks and cranes, and transporting it to the mixer are considered. The automatic water measuring tank and the batch meter are recommended.

UNLOADING FROM RAILROAD

The unloading of materials at the railroad station offers a problem in design of plant. The method of handling the remainder of the job will in a large degree determine the economical type of unloading equipment. The methods employed for unloading materials may be divided as follows: First, unloading by hand into either wagons, trucks, or movable hoppers that are hung against the side of the car and from which the material is dumped into trucks or wagons; second, mechanical unloading, using bucket elevators or skip hoists from pits below the track; third, clam-shell bucket operated by a stationary derrick; and fourth, the use of a portable crane. The first and second of these methods have been very successfully used where comparatively small amounts of materials were handled or where the material could be obtained in bottom-dump gondola cars, but will not give the required capacity where the storage must be at the railroad station and not on the sub-grade. The fact that labor is expensive and difficult to get makes it desirable to use labor-saving devices wherever possible. It is recommended that consideration be given to the derrick and the crane.

The guyed derrick has many advantages over the stiff-legged derrick for this class of work, as it is possible to swing through 360 degrees and store materials behind it. Stiff leg derricks are being used successfully but the shorter swing is a disadvantage. If stiff leg derricks are used, however, they should be set up with one leg parallel with the railroad track so that maximum advantage can be taken of this swing radius.

There are two types of cranes which have been used extensively, first, the locomotive crane operating on railroad tracks and handling materials to stock piles parallel with the track and from them or from the cars into measuring bins; and second, the auto cranes which operate either on traction wheels or caterpillars. Either of these machines is satisfactory, the location, quantity to be handled and general conditions determining which to use. Speed of movement and ability to store a considerable quantity of material are essential features.

There have been many advocates of the use of tunnels in connection with locomotive cranes. The expense of such tunnels, however, does not seem to be justified as against the use of open bins holding between one and two industrial train-loads of material, as the latter are portable to the extent

that they can be picked up with the unloading crane or derrick, loaded on to cars and shipped to the next job. They have the advantage of being easy of access, allowing the men to work in the sunshine instead of darkness and of being easily cleaned in case of any clogging. The placing of the loading bins on flat cars offers many advantages where a locomotive crane is used, as it makes possible the moving of this bin to any place desirable for loading, dependent only on the location of the car to be unloaded.

A word of warning on the design of unloading plants may not be out of place here. In the past, many contractors have made the mistake of designing their unloading plants with too small storage capacity to allow the crane to store materials as rapidly as they can be obtained. For a one-mixer operation, it is recommended that a contractor have on hand a storage of at least 2,000 tons of stone and 1,000 tons of sand and that he equip with an unloading plant having a capacity of at least 300 cu. yds. of material per day.

The expenditure of large sums of money for plant requires that all parts be nicely balanced. Many men have found large equipment expensive and have finished the job with a loss because their plants were not balanced. For instance, they may have had a large unloading plant and a small mixer, a large mixer and a large unloading plant but poor transportation facilities for handling the materials to the mixer, or they have purchased and gone into the industrial railway not affording themselves sufficient storage at the unloading plant to keep going when deliveries were slow.

With a central proportioning plant, the use of bulk cement has proven very efficient. The materials in this instance are usually shipped in gondola cars with tarpaulin covers, unloaded with the clam-shell that unloads the aggregate, and placed in overhead bins from which it is measured by volume into the batch boxes.

The demand for mechanical equipment is the outcome of the desire of the contractor to reduce the number of men required to build a mile of road per mixing unit. This has brought to the fore larger mixers in order that the unloading and hauling equipment may be used to its full capacity. A mixer holding 28 cu. ft. of concrete equipped with a boom and bucket and charged with a crane, having a capacity of from 100 to 125 ft. of 16-ft. road per hour, has been built. Roads have been built at this rate in Michigan. One batch box is used for each industrial car instead of two used with the smaller.

† Of the Koehring Machine Co.

* Concluded from the June 26 issue, page 572.

machine. The design of the large mixer has been materially changed from that used for the paver with a capacity of 14 to 21 feet, in that the boxes are picked off cars with a separate crane and dumped into a batch hopper above the mixer. In this way one operation is done away with, that of lifting the charging skip.

On machines of 10, 14 and 21 ft. capacity, the derrick operated by a power hoist swings the boxes from the car into the loading skip, after which the empty box is swung back and the materials hoisted into place. In this way it is possible to use a standard mixer which may be used either with wheelbarrows or with loader as well as with industrial railroad. The use of a separate crane with the smaller mixers is not economical, as the output is not commensurate with the cost.

MIXING

Based on laboratory results, many state highway departments specified the use of concrete having a dry consistency, but the results of this year's work point out the desirability of accepting a workable consistency rather than an excess or deficiency of water. In the field the advantage in strength of concrete due to reduced water is offset by the added expense involved in handling the concrete. The boom and bucket distributing system has proven the most economical method of placing concrete on the grade and in the ability to place the concrete on the sub-grade with one-man control.

To guarantee standardized concrete two automatic features have been incorporated into the mixer, first an automatic water measuring tank, so built that the quantity of water can be controlled and the same amount used for each batch; and, second, the batch meter, which controls the time of mixing.

The measuring of the water is accomplished by filling the water tank to its full capacity and then drawing it down to the bottom of the discharge pipe, the elevation of which can be changed to give the required amount of water. The tank is located crosswise of the machine, so that the quantity of water per batch is the same regardless of whether the machine is traveling on a level of the road or on a grade. In order to insure uniform quantity of water per batch, the operator should open the valve into the mixer as soon as the last of the preceding batch has been discharged and leave it in this position until he has lowered the charging skip. This will give the proper time for discharge of water and insure uniform consistency of the batch. If, on the other hand, the operator does not open and close the valve at regular intervals, one batch will be dry because the tank has not emptied and the next will have the desired amount of water. The result will be a varying consistency.

The batch meter insures the time that the batch remains in the drum of the mixer, locking the discharge chute when the material enters the drum and releasing it at the expiration of the time specified. Announcement of the fact is made by the ringing of the bell.

Reference has been made to the desirability of the use of machinery as a pace-maker for the crew. One contractor found this year that he was making

time and getting out yardage by organizing his crew around the batch meter. The basis of all efficient engineering is time study and timing of operations. The batch meter offers the contractor a time control for his forces.

Luten Bridge Patents Held Invalid

In holding all the Daniel B. Luten patents involved in the suit at issue as invalid, the United States Circuit Court of Appeal for the eighth district recently, in a sweeping decision upholding the verdict in the district court of the United States for the district of Nebraska, scathingly scored Luten and the National Bridge Company for their methods of advertising and exploitation.

Comments of the court in the recent decision are interesting. The following are a few brief extracts:

"We have examined the patents here directly involved and the others contained in the record, and the numerous patents of the plaintiff which have been described in the cases to which we have referred. We are convinced that they are all void for want of patentable invention."

"Insofar as we can discover, none of the Luten patents has ever been sustained in a contested case, and they have been frequently held to be invalid for want of general patentability. Notwithstanding this experience, these patents have been exploited by skillful campaign of advertising in which it has been repeatedly asserted that no suit based on a Luten patent has ever been lost or dismissed. This work has been done through the agency of the National Bridge Company of Indianapolis. The record in this case leaves no room for doubt that the entire scheme by which it has promoted these patents has been fraudulent."

"While Mr. Luten has made no invention, he has made a great discovery, namely, that not more than one city or county attorney or attorney general in ten knows anything about patent law or the proper interpretation of consent decrees in that field. It has resulted that cities, counties and states have been easy victims for the peculiar arts of the National Bridge Company, for they were without trustworthy legal advice. With the above element to play upon it has been easy to convince public authorities that the way of safety was the way of wisdom and that this consisted in employing Mr. Luten as an engineer or paying him ten per cent royalty for the use of his patented device."

"A continuation of the bridge company practices under these void patents would be a grave wrong."

The fight against Luten and his patents was started by the Iowa Highway Commission, assisted by Harry E. Sampson, then assistant attorney general, some six or seven years ago. Previous to that time no determined fight had ever been made on these patents, which the commission believed to be invalid. Contractors, towns, cities and counties, when threatened with infringement suits, had invariably settled out of court rather than attempt an expensive fight in defense. The Highway Commission engineers, aided by the attorney general's office,

collected the evidence necessary to show the invalidity of the patents. Since the collection and preparation of that evidence, Luten has never won a single suit in any state.

State Hires Road Contractors' Equipments

Contractors and their outfits were hired by the Commissioners of Iowa to perform road work, and this proved so satisfactory with two outfits last year that five are being hired this year.

Last year Iowa inaugurated a road building experiment which was believed to be unique in that two independent individual contractor's outfits were hired with which to build the Montgomery county Federal-Aid road, instead of contracting for the construction of the road with the contractors. The experiment proved so promising in its preliminary tryout that this year five separate complete outfits have been hired and put to work in order to rush completion. The experiment is unique in that, so far as the state, federal and county officials concerned know, it is the first and only one in which such a system has been tried out.

The experiment is an effort to find out under actual working conditions what it costs, under fair average conditions, to do road grading work and, incidentally, to have some definite and reliable basis upon which to approve or disapprove prices on such work offered by contractors at road lettings.

For a considerable time before the work was undertaken last year, bids received on road grading work ranging as high as $55\frac{1}{2}$ to 60c. per yard had been considered by the commission to be too high. When on July the low bid on the 216,000-cubic-yard job of earth moving in Montgomery county was found to be 55 cents, the state and county officials decided to reject all bids and make a counter proposition to the two low contractors, P. J. Ryan, of Des Moines, and E. J. Wilson, of Council Bluffs. The proposition was to hire their entire outfits and equipment, owners included, for a stipulated sum. The commission agreed to stand all labor hire, all bills for groceries and provisions, horse feed, and repairs (except harness repairs) on the equipment. Ryan and Wilson, the owners, were each required to give their entire time to the management of their own outfits under constant direction of the commission's resident engineer, B. J. Condon, a former Montgomery county engineer.

The work started on July 20. Good weather and good working conditions enabled the crews to make an unusually low record for the first few weeks, dirt being moved for as low an average as 30 cents. Later, more difficult work was encountered. Work in the hills in the vicinity of the Nodaway river became very expensive. Sand had to be removed for long stretches and earth filled in to build up the grade. There was a great deal of grubbing and removal of trees and stumps. Over 2,500 sticks

of dynamite were used. A blasting gang was kept busy during almost the entire working time. There was one 13-foot cut and one 16-foot fill. By the end of the working season the most difficult work of the entire job had been completed. Eighty thousand yards of earth had been moved for a total of \$50,978.56 or an average of 52 cents per yard. The figures up to this point in a way justified the bids by the contractors of $55\frac{1}{2}$ cents at the letting.

Last year there were the two outfits, of Mr. Ryan and Mr. Wilson. Each had an 18-team elevator grader outfit. Three more similar outfits have been contracted for this season and at present the five outfits are all at work. The job was, so far as known, the first large federal-aid job to get under way in the state this year. With the great advance in prices for labor, supplies and food, the engineers in charge, it is feared, will have a difficult time in holding the cost down to last year's figures. However, the most expensive work has been completed. What remains is comparatively easy excavation and reasonably short hauls. With a good early start with the five outfits with their hundred head of horses and mules, their 75 or 80 men, and equipment all in good shape as a result of careful overhauling during the winter, the work will be rushed to completion just as quickly as possible.

Incidentally, the carrying of the job over into the 1920 season will give an opportunity to find out what work is going to cost under this season's working conditions and form a reliable standard upon which to pass judgment upon 1920 grading prices. The figures obtained up to the close of work last season of 52 cents per yard in a way justified the low price bid at the letting of $55\frac{1}{2}$ cents. It is hoped, however, even under present conditions, to lower this average somewhat and show a substantial saving.

Incidentally, it will be a matter of satisfaction to have at hand actual cost data on earth excavation and road grading on a job of such magnitude, as a basis upon which to approve or disapprove bids offered by contractors at road lettings.

Texas Highway Plans

The total contracts let by the Texas State Highway Department for 1920 to date amount to \$8,500,000 and call for the construction of approximately 700 miles of highway. There are at present 183 active federal aid projects and 120 state aid projects in the state involving the construction of 2,500 miles. The state highway department has approved plans for federal aid work on projects aggregating \$6,500,000, of which amount the federal bureau of public roads has formally approved \$2,520,486 worth of improvement.

Up to date more than 20,000,000 square yards of concrete pavement contracts have been awarded in the United States since January 1, 1920. The awards for the week ending May 1, aggregated \$2,863,800.

A bond issue of \$15,000,000 to construct street car subways in Cleveland has been voted down.

Some Developments in Brick Road Construction*

Setting forth the advantages of the standard lugless paving brick, and predicting that foundations will soon be adapted to the soil under them and the load they are to carry.

In cooperation with engineers, the paving brick manufacturers have taken the lead in bettering their product, improving the details of brick pavement construction and insisting on good specifications being lived up to.

STANDARD SIZE AND SHAPE

One of the recent steps in the betterment of the brick themselves is the adoption by the manufacturers of a standard shape and size of paving brick suitable for use under all conditions of traffic and method of construction. It is a square edged, side wire-cut, lugless vitrified brick 3 x 4 x 8½ inches, laid either on edge, making a four-inch depth wearing surface, or flat with three-inch depth, after the principle of vertical-fiber brick which, for the past eight years, has been used successfully in states west of the Mississippi. From the manufacturers' standpoint, this standard size is much the most economical to make and burn, the cost is less per ton than for other sizes, and by avoiding making specially shaped or sized or patented pavers, the plant efficiency is much increased, thus making a further reduction in costs.

On the other hand, the purchasers get a more uniform product, a better quality of brick material, and one structurally stronger. The same sized brick can be used to provide either a four-inch or three-inch depth of wearing surface, while the square edges and straight surfaces provide a uniform width of joint from top to bottom for either cement grout or bituminous fillers.

This style of paver is the result of years of experience in the manufacture of paving brick and is recommended for use. It is not being "foisted" upon the "unwilling" public as some would have it believed. The older types of pavers can still be obtained, but it is the best judgment of many of the manufacturers, and of those engineers who have had sufficient experience in their use to be able to express an opinion, that this "new" standard is a distinct forward step, and should be given first place in specifications.

Most of the objections to its use are based on the absence of lugs. In all other block pavements, the modern tendency is to get the joints as narrow as possible and eliminate rough riding and cobbling. Lugs have not been an insurance against improper grouting—the only insurance in this respect is proper care in selecting the sand, mixing and placing. If these ordinary, well established precautions

are taken in grouting, good results will be obtained with narrow joints and a smoother, more durable pavement secured. In practice, the process of setting the brick in the cushion and especially of rolling, slightly spaces the individual brick and provides ample space for a cement grout, using fine sand and of the proper consistency, to penetrate to the bottom of the joint. With a bituminous filler, of course, the narrower the joint the better.

As stated above, paving brick manufacturers west of the Mississippi have been making this style of paver for the past eight to ten years, and since 1916 without lugs. The lugless feature was adopted at the request of city engineers who had been using asphalt filler exclusively but has since been used with grout filler in the comparatively few instances where grout has been specified, without a failure to the writer's knowledge.

FOUNDATIONS

The near future will see the passing of the so-called standard designs of roads as far as the foundations are concerned, and we will no longer have standard foundations applicable over a whole state, or over a whole county or even over a single road of any length. Economical foundations are a matter of more serious consideration than is usually given them by highway engineers. On the other hand methods of construction and other features of the wearing surface will in the near future be much more thoroughly standardized between states as well as other civic units than they are at present. In other words, if the sub-grade preparation and foundation construction are such that, under conditions of traffic, the wearing surface is always given the same chance to maintain a smooth, uniform condition best adapted to resist impact, speed and wear, the same depth and detail of construction of the wearing surface would apply as well in one locality as in another where climatic and traffic conditions are alike. On the contrary, foundations will be constantly varied to take care of the continually varying subgrade.

Seven Millions of Public Work in Philadelphia

The total cost of work under contract and under way in Philadelphia since early January on municipal improvements, including paving and construction of sewers, bridges and water supply systems, is \$7,030,636. This amount covers 278 contracts, 164 of which, totalling \$3,638,250, were for paving work. Seventy-two contracts are for sewers, and contracts awarded by the Water Bureau total 34.

The Niagara Peninsula branch of the Engineering Institute of Canada is planning for a meeting to be held at Niagara, Ont., September 16, 17 and 18, at which 500 engineers from all parts of the dominion are to be present. The branch has just closed a successful year, having greatly increased its membership.

Natural gas from a local well will probably be utilized for fuel in the municipal electric light and power plant and pumping station at Brownwood, Tex.

*Abstracts from a lecture delivered before engineering schools by Clark R. Mandigo, chief engineer, Western Paving Brick M'frs Ass'n.

PUBLIC WORKS

Published Weekly at
FLORAL PARK, N. Y.

by
Municipal Journal and Engineer, Inc.
ADVERTISING, SUBSCRIPTION AND EDITORIAL OFFICES AT 243 WEST 39TH STREET, NEW YORK, N. Y.

Address all communications to the New York Office.

Subscription Rates
United States and Possessions, Mexico and Cuba.....\$3.00 per year
All other countries\$4.00 per year

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Western Office: Monadnock Block, Chicago

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A Disgraceful Financial Policy

The protest on page 15 against the continued delay on the part of the city of New York to keep its sacred pledge or to pay just debts long overdue, is put in strong language but none too strong. The stinging rebuke is well merited and ought to arouse enough public attention to compel the prompt settlement, at this late date, of the claims in question.

The facts are that at the entrance of the United State into the world war there were more than thirty important subway contracts under construction, most if not all of which had been very seriously delayed by the changed conditions brought about by the war, that had already resulted in a heavy increase of the cost of labor and materials to the contractors above those costs which prevailed when the contracts were awarded, and which could not at that time be foreseen. This necessarily involved heavy losses to the contractors who were prepared to accept them and who were faithfully performing their obligations notwithstanding the fact that in many cases they had suffered great additional hardship through unexpected changes and delays in the drawings, specifications and other requirements that dragged the work along that might otherwise have been concluded much more economically under the former prices.

Some of the contractors were already in distress, and all of them had suffered considerably so that relief was called for, and on June 15, 1918, the Board of Estimate specifically promised the representatives of the contractors that if they would complete the work, of which the city then stood, and in some cases still stands, in urgent need, just payment should be made for it and additional costs to the contractor should be assumed by the city.

On the strength of this formal official assurance, equivalent legally to a contract, the already embarrassed contractors went on and spent more than \$7,000,000 with the expectation of speedy reimbursement. This was such a heavy drain on their finances that several of the contractors, some of whom had thus expended \$2,000,000 each, were greatly embarrassed and some of them barely escaped positive bankruptcy, being greatly crippled in their subsequent operations. Nevertheless, after more than two years, less than 10 per cent of these

just claims have been paid by the city and there appears to be very slight inclination of the responsible officials to liquidate these claims.

In former years contractors with the highest reputation and long city records for honest, efficient, prompt work had great difficulty in collecting just bills from the city, and have been obliged to resort to slow and costly litigation, and have generally felt that in many cases the policy of the city is to throw the greatest possible responsibility on the contractor, regardless of the merits of the case, and to pay him as little as possible and as slowly as possible for the work regardless of the just compensation.

That such conditions can prevail in New York or any other American city is not only disgraceful but perilous in that, besides discouraging the efforts of loyal and efficient contractors, it encourages a most dangerous disregard of honest obligations that is little if any less mischievous than the deliberate violation of its contracts by labor.

Profitable Co-ordination of Practical and Theoretical Considerations in Waterworks Design

There is commenced in this issue a paper on the design of the Winnipeg Aqueduct which, properly interpreted, is remarkably illuminating in its presentation of the manner in which exceptionally satisfactory technically and financial results were obtained in the design and construction of a great water supply system.

To a very thorough preliminary investigation of the subject were added a keen analysis of conditions and a judicial equating of difficulties, advantages and requirements, which enabled the design to be made in such a way as to co-ordinate the possibilities of construction and operation. The result has been the eminently successful construction, during the worst of the war period, of a large and costly aqueduct and appurtenances practically within the originally estimated time and cost, executing the work with great rapidity and excellence and providing a high-class durable structure with a capacity more than 17 per cent greater than was called for.

The Winnipeg Aqueduct, built through uninhabited wilderness, under difficult topographical and climatic conditions, consists of eighty miles of horse-shoe shape gravity concrete construction and seventeen miles of circular reinforced concrete pressure pipe which, with its appurtenances, was built and put in operation in four years and five months after the award of the contract at a cost of about \$15,000,000 and with a capacity for furnishing 100,000,000 imperial gallons of water daily.

In its construction about \$1,000,000 was saved by means of a careful analysis of the effects of the grade on the size and cost of the aqueduct, which resulted in making the total length about 8 per cent longer than that of a straight-line location. An important saving was effected by dropping the hydraulic grade line, at the junction of the flat and steep grades, so as to reduce the maximum depth of cut 1 foot for the 9-mile summit section 22 feet deep in difficult ground covered with swamp.

Another important feature is the delivery of daily supply up to 25,000,000 gallons to the Winnipeg reservoir without pumping, by the construction of a pressure aqueduct 15 miles long across the Red river valley. Provisions for future increased supply can be made by the installation of a pumping station which, increasing the velocity of flow through this section of the aqueduct from $1\frac{1}{2}$ feet to 4 feet per second, will deliver 50,000,000 gallons of water daily.

In designing the aqueduct the coefficients used in the computations of the Nashua Aqueduct were adopted as reliable and conservative. The capacity calculated by them was about 95 per cent of that for an aqueduct of the same dimensions as the Nashua aqueduct. This value proved to be entirely on the safe side when measurements of actual flow through the completed aqueduct showed a capacity of 100,000,000 gallons per day instead of the 85,000,000 gallons indicated by the computations.

A Cause of Labor Shortage

An important, if not the principal cause of labor shortage in this country, is the preposterously high wage and short hours that is increasingly prevailing. The high wage enables the laborer to secure enough for his necessities in a very short time, permits him to indulge in vicious and extravagant practices, greatly demoralizes his general attitude, breeds a dislike for industry, and affords ample leisure for all kinds of mischief.

The short hours decrease the amount of production much more than their nominal diminution of working time because, no matter how short they are, they carry practically the same actual amount of overhead loss in beginning and stopping work and in various other items of lost time that are scarcely greater in a 10-hour day than in a 6-hour day. Therefore in order to maintain the same production a disproportionately larger force of men is needed and the supply, depleted by decreased immigration, is insufficient.

Two recent examples thoroughly prove these statements, namely the renewed demands of the Chicago garbage collectors for an increase from \$4.40 to \$5.60 per day, and their rejection of the offer of \$4.76 and threats for a renewed strike which could only be maintained by reason of a surplus from excessive wages sufficient to enable them to live in idleness while the city suffers for their services. The same is true of the striking longshoremen in eastern cities who are maintained in comfort from the same source and have enjoyed a long season of complete idleness, turbulence and discontent. It does not take a very long memory to go back to the times when, it is common knowledge, that many strikes were called on the flimsiest pretext, and when after a longer or shorter vacation the men returned to work on their own terms, the employers were forced to pay them besides the increased wages, their full pay for all of the "waiting time" they were idle on strike. With all of this necessarily comes the greatly decreased efficiency of labor as illustrated by the specific case of the average bricklayer who in 1914 laid 1,900 bricks a day for \$5 and now lays 800 bricks for \$9.

The legitimate results of this evil condition are emphasized in Chicago, where with the 1920 budget already over-appropriated by \$4,500,000, new wage scales are demanded by the unions that average a 20 per cent increase and, if granted will add nearly \$1,000,000 to the already impossible budget. If not granted, the unions will probably encourage strikes that will endanger the safety of the city.

There can be but one answer to this rapidly growing evil, namely legislation must be made and enforced to prevent and severely punish strikes of government, municipal or public utility employees; labor unions must be incorporated; immigration must be encouraged and increased; existing laws must be uniformly enforced without exemption for labor unions or truckling to their political support; and employers must combine solidly and refuse to pay inordinate wages or to accept inefficient, unreliable service.

Meeting Labor Shortage

The water department of New Bedford, Massachusetts, needs twice as many laborers as it can secure and its superintendent, Steven H. Taylor, says that "out of one lot of 80 names of eligible laborers, we got 8 men, and 4 of them quit at the end of the first day's work." Most of the eligibles notified that work is ready for them reject pick and shovel jobs and wish to be watchmen or water carriers, although the pay for laborers is now \$4.50 per day.

To meet this condition the city has purchased a steam shovel which will replace a large quantity of labor now required for excavating work, and it has also contracted for a new pipe joint compound that will greatly reduce the amount of labor required in laying new water mains, because it will eliminate the time of two men for two hours to calk every joint of a large pipe.

Experience With Chinese Labor

Santa Rosa, California.

May 27, 1920.

Editor PUBLIC WORKS:

Dear Sir—

I have used Chinese labor to a limited extent in contracting and also in farming. On construction work I have found this class of labor fairly reliable and honest, and when used for hired help on the farm I have known them to be unreliable and absolutely dishonest.

Chinese or Japanese on coming to this country wish to get in possession of the land, and when working for wages on the farms do all they can to impoverish the land. They damage your plants and your trees, and they pack your fruits and vegetables so wretchedly that no profit can be made where they are employed.

When the owner's profits have become unsatisfactory, they lease or buy the land and by the greatest of industry proceed to enrich the soil; they raise wonderful crops and they finally gain control of the market for food stuffs. When they have the control they make their own price to consumers. Potatoes are now eight cents per pound in California and a Japanese is potato king.

These races are natural farmers and it will be a bad thing for this country as they extend their ownership or control of the soil.

If laws would be passed prohibiting Asiatics from owning or leasing the soil, and also prohibiting citizenship to Asiatics born in this country, I would favor their admission to our country. Otherwise I am opposed.

My principal business is contracting, but also engaged in farming.

Yours very truly,

G. W. CONNERS,

Effect of Shortened Working Hours

The records of the Federal Reserve Board show that the production of raw materials in this country was 10 per cent less in 1919 than in 1918, and that the production of fabricated material was 25 per cent less.

In investigating this subject the New York *World* has concluded that the principal factor is the shortened hours of work inaugurated during the war. "In every instance, almost without exception, where a decrease of production is shown," says the investigator, "there has been a reduction in the number of hours of work each day of each week." In many cases the decrease was found to coincide strikingly with the actual shortening of the working day, as for example a factory reducing its output 20 to 25 per cent when the working day was changed from ten hours to eight.

To Stabilize Construction

The Employers' Association of Manitoba has issued the following "statement of aims": (1) to promote industrial peace, commercial prosperity in the community and the steady employment of labor; (2) to discourage lockouts, strikes, and unfair demands by either employer or employee; (3) to secure for employer and employee freedom of contract in employment; (4) to disseminate knowledge of fundamental economic laws.

Wage Maximum for Construction Workers

The weekly edition for June 12th of the Bulletin of the Associated General Contractors' of America, devotes considerable space to construction wages and gives a table of rates in 21 cities in 17 states, in which the maximum and minimum hourly union rates are, for masons, \$1.50, Shreveport, Louisiana; 85c, Richmond, Ind.; bricklayers, \$1.50, Shreveport, La.; \$1.00, Washington, D. C.; structural iron workers, \$1.25 in several cities, 98c, Washington, D. C.; ornamental iron workers, \$1.25, St. Louis and Cleveland, 87½c, Seattle, Washington; reinforcement rod setters, \$1.25, St. Louis, Omaha, Fargo and Cleveland, 87½c, Seattle; plasterers, \$1.50, Shreveport, La., 87½c, Richmond, Ind.; wood lathers, \$1.25, San Jose, Calif., \$1.00 Washington, D. C.; metal lathers, \$1.25 in several cities, \$1.00 Washington, D. C.; hoisting engineers, \$1.25 Omaha and Cleveland; 65c, Waterloo, Iowa; tile setters, \$1.25 Springfield, Illinois, and Sioux City, Iowa; \$1.00, Washington, D. C.; plumbers, \$1.50 Dallas, Texas; 87½c Aberdeen, S. Dak.; carpenters, \$1.25 Cleveland, 85c Richmond, Ind.; stone cutters, \$1.25 Dallas, Texas, 80c Aberdeen, S. Dak.; marble cutters, \$1.12½c San Francisco, 67½c St. Louis; painters, \$1.10 Omaha, 75c Richmond, Ind.; electrical workers, \$1.25 Omaha and Cleveland, 80c Aberdeen, S. Dak.; roofers, \$1.25 San Jose, Calif., 75c Shreveport, La.; cement finishers, \$1.25 in several cities, 90c in several cities; elevator erectors, \$1.25 St. Louis, 90c Washington, D. C.; pipe coverers, \$1.12½ Cleveland, 75c Springfield, Ill.; hod carriers, \$1.12½ San Jose, Calif., 60c Shreveport, La.; laborers, 87½c Cleveland, 40c Atlanta, Ga.

At San Francisco, the agreement between the unions and the general contractors has expired and new demands are being made for plasterers at \$1.56¼, structural iron workers and hoisting engineers \$1.25, carpenters \$1.12½, hod carriers \$1.25 and laborers 81¼c.

At Washington, D. C., a bonus of \$1 per day above wage scale is being paid to bricklayers and plasterers.

In Cleveland plumbers are on strike for an increase to \$1.50 from \$1.

In San Francisco, plasterers are demanding a raise from \$1.25 to \$1.56¼. Structural iron workers, hoisting engineers and plasterers are demanding \$1.25.

In Springfield, Illinois, the efficiency of workmen is reported at about 50 per cent. In Seattle, Washington, where voluntary limitation of output was practiced under the closed shop, a notable increase in the efficiency of labor has been developed since the Master Builders' Association declared for open shop.

For the loss of a hand, compensation of \$4,128.48 to be paid at the rate of \$19 per week for 244 weeks has been awarded by the compensation commission, New York.

The Interstate Commerce Commission has declared an embargo on cars for shipment of bituminous coal to Lake Erie ports for transshipment by water, except on a permit.

The embargoes recently declared by several eastern railroads are attributed by them to insufficient ships and to the unusually large number of cars in transit especially coal cars. The longshoremen's strike is not, however, assigned by them as a cause for the congestion.

Dishonest Municipal Treatment of Loyal Contractors

In a recent official letter addressed to the Board of Estimate and Apportionment of the city of New York, T. A. Crane, secretary of the General Contractors' Association, called attention to the fact that the report of the committee on finance and budget of the Board of Estimate and Apportionment submitted May 28th, while dealing with claims for labor and materials furnished to the Board of Education in 1918, and for which payment has not yet been made because of no request for an appropriation to cover them, stated that on June 15, 1918, the Board of Estimate promised the Contractors' Association that if the contractors would carry to completion the subway work then under construction, they should receive just compensation and that unexpired contracts should be modified or supplemented if completed within a reduced time limit and that compensation should be to equal the increased cost of labor and materials due to the war.

Although the contractors have loyally fulfilled their part of this agreement and have spent more than \$7,000,000 of their own money, largely on credit, to complete subway work, many sections of which have been finished and are now in operation, Mr. Crane says:

"The Board of Estimate, in refusing to carry out its agreement, has swindled those who relied on its integrity. The disgraceful admission must be made that the word of the City of New York, as given by the present administration, is good for nothing; that the mayor and comptroller are willing converts to the Berlin idea that a promise is merely a scrap of paper.

"The situation is one in which the good faith of the city, as pledged by the Board of Estimate, is involved. Accepting the promise as made in good faith, the contractors went ahead with their work and many of the sections were completed and are now in operation.

"Thus far only four settlements have been made, two of them on the large contracts and two on small ones, involving less than \$700,000. For some reason, best known to the Board of Estimate, some thirty other subway contracts, equally meritorious, have not been settled and efforts to secure settlement, either under the promise or through legislation, have persistently been blocked by the city administration."

The U. S. Shipping Board refused the increased wages demanded by 4,000 striking longshoremen at Philadelphia and against similar demands of the shipyard workers on the Pacific Coast and the strikes are reported as broken and the men as returning on open shop basis.

Regulation of Immigration

At the recent international conference, action to co-ordinate existing governmental immigration activities was taken by the 500 delegates from 30 racial groups working with prominent leaders in industry, finance, agriculture, labor and education.

It was proposed to create a board of assimilation to facilitate the distribution of immigrants and to Americanize them. The repeal or modification of the literacy test was urged as was the enforcement of immigration laws directed against anarchists and their like. It was stated that investigations confirmed the fact that our foreign born residents as a class are law abiding, industrious and thrifty, and measures were endorsed to provide for the compulsory education of immigrants.

Extensive Housing Construction

All kinds of construction work would be greatly benefited by the rapid amelioration of the housing difficulties that have been steadily increasing in most parts of the country and especially in New York City. The New York Mayor's Housing Conference Committee announces that speculative builders promise to keep operating at cost, irrespective of immediate profits, if mortgage money is forthcoming and if labor promises a fair day's work for a fair day's pay. Three thousand six hundred and fifty lots have been pledged, subordinate to mortgage, and the Board of Estimate and the State Legislature will be asked to help all public buildings until the housing shortage is overcome.

Efforts are being made to exempt new buildings

from taxation for a stated period and labor will be asked only to continue its arrangement as to wages and hours for one year or until the completion of the operation on which the men may be engaged. It will be remembered that previous generous efforts for building construction were immediately met by the labor unions by demands for increased pay and for the rejection of all building materials that had passed through non-union hands.

Proposed Regulation of Industrial Relations

A committee of prominent and influential members of the United States Chamber of Commerce has prepared a statement of twelve propositions for the government of American industrial relations, which have been submitted for a referendum vote to more than 1,300 industrial and commercial organizations included in the Chamber of Commerce of the United States.

This committee was appointed after the adjournment of the first industrial conference called by President Wilson, and its proposals are intended to include the fundamentals of employment relations. The referendum carries references to arguments in the negative so that voters may be able to study the recommendations fully before voting is closed at the expiration of forty-five days.

The committee's report recognizes the necessity for justice, equality and individual liberty; that the terms of employment should conform to the essential requirements of economic law and sound business practice; that they should conduce to mutual interest and higher productive efficiency; and should realize broad ideals of individual and social betterment. Orderly government and public service must be assured and the paramount interest of the public protected. With these considerations in view, the committee states its belief in the following principles:

"1. Any person possesses the right to engage in any lawful business or occupation and to enter, individually or collectively, into any lawful contract, either as employer or employee. The rights are subject to limitation only through a valid exercise of public authority.

"2. The right of open shop operation, that is, the right of employer and employee to enter into and determine the conditions of employment relations with each other, is an essential part of the individual right of contract possessed by each of the parties.

"3. All men possess the equal right to associate voluntarily for the accomplishment of lawful purposes by lawful means. The association of men, whether employers, employees or other, for collective action or dealing, confers no authority over, and must not deny any right of those who do not desire to act or deal with them.

"4. The public welfare, the protection of the individual and employment relations require that associations or combinations of employers or employees, or both, must equally be subject to the authority of the State and legally responsible to others and that of their agents.

"5. To develop with due regard for the health, safety and well-being of the individual, the required output of industry is the common social obligation of all engaged therein. The restriction of productive effort or of output by either employer or employee for the purpose of creating an artificial scarcity of the product or of labor is an injury to society.

"6. The wage of labor must come out of the product of industry and must be earned and measured by its contribution thereto. In order that the worker, in his own and the general interest, may develop his full productive capacity, and may thereby earn at least a wage sufficient to sustain him upon a proper standard of living, it is the duty of management to co-operate with him to secure continuous employment suited to his abilities, to furnish incentive and opportunity for improvement, to provide proper safeguards for his health and safety and to encourage him in all practicable and reasonable ways to increase the value of his productive effort.

"7. The number of hours in the work day or week in which the maximum output, consistent with the health and well-being of the individual, can be maintained in a given industry should be ascertained by careful study and should never be exceeded except in case of emergency, and one day of rest in seven, or its equivalent, should be provided. The reduction in working hours below such economic limit, in order to secure greater leisure for the individual, should be made only with full understanding and acceptance of the fact that it involves a commensurate loss in the earning power of the workers, a limitation and a shortage of the output of the industry and an increase in the cost of the product, with all the necessary effect of these things upon the interests of the community and the nation.

"8. An adequate means, satisfactory both to the employer and his employees and voluntarily agreed to by them, should be provided for the discussion and adjustment of employment relations and the just and prompt settlement of all disputes that arise in the course of industrial operation.

"9. When, in the establishment or adjustment of employment relations, the employer and his employees do not deal individually, but by mutual consent such dealing is conducted by either party through representatives, it is proper for the other party to ask that these representatives shall not be chosen or controlled by, or in such dealing in any degree represent any outside group or interests in the questions at issue.

"10. The greatest measure of reward and well-being for both employer and employee and the full social value of their services must be sought in the successful conduct and full development of the particular industrial establishment in which they are associated. Intelligent and practical co-operation based upon a mutual recognition of this community of interest, constitutes the true basis of sound industrial relations.

"11. The State is sovereign and cannot tolerate a divided allegiance on the part of its servants. While the right of government employees--national, state or municipal--to be heard and to secure consideration and just treatment must be amply safeguarded,

the community welfare demands that no combination to prevent or impair the operation of the government, or of any government function shall be permitted.

"12. In public service activities, the public interest and well-being must be the paramount and controlling consideration. The power of regulation and protection exercised by the State over the corporation should properly extend to the employees in so far as may be necessary to insure the adequate, continuous and unimpaired operation of public utility service."

Engineering Experts Recommended for Labor Unions

In an article by M. L. Cooke recently published in the *New Republic*, a plea is made for participation by labor in the management and administration of production, and it is admitted that such management needs the assistance of outside engineers and other experts practising a primary allegiance, either to labor or to capital or to the public rather than to all three. It is therefore recommended that labor should retain its own production engineers, and other technicians having scientific knowledge of the development of better ordered industry. Those seeking the public interest as well as those retained by the owners, will thus be in a position to counsel with well informed representatives of labor.

Theoretically this is sound reasoning, but in order to be practical and beneficial, it is vital that the engineers and experts retained by labor must themselves preserve the highest tradition of their class, namely, to maintain judicial impartiality and absolute justice and accuracy. It is very evident that such experts could not be members of the labor unions under their present constitutions, which require allegiance to the class interest above public interest or even public justice, restrict production and, in practice if not in specific letter, promote violence, intimidation and conspiracy.

More Outlaw Rail Strikes

About 600 yardmen in the employ of the Baltimore & Ohio and the Pennsylvania railroads struck in Baltimore June 20 without making demands on the railroads, without warning, and without giving any cause for their action. It is said, however, that the strikers are mostly under thirty years of age, and are directed by the leaders of the April strikes, and that the strike is not so much against the railroads as it is against the Railroad Labor Board because the latter has not completely granted all their demands as quickly as they desired. The strikers expressed their sympathy with the striking longshoremen and stevedores and say that with "The harbors closed and freight congestion, the demands of both will be met shortly."

This strike and that of the yardmen in the Philadelphia district on June 18th has crippled the movement of freight in both Philadelphia and Baltimore, and both of the railroad companies affected have placed embargoes in the local yards on all freight except perishables, live stock, food and fuel for public utilities.

Recent Legal Decisions

ORAL CHANGE IN TERMS OF WRITTEN EXCAVATION CONTRACT

A written contract was executed for certain excavating, grading, back-filling and concreting at fixed and definite prices per cubic yard. In an action for alleged balance due after the work was completed, the real question in dispute was the contractor's claim that the owner agreed that the unit prices named in the written contract should not be the measure of compensation for the work then or thereafter to be done, but that it should pay for the work and material the fair and reasonable value thereof. The Circuit Court of Appeals, Sixth Circuit, holds, *United Steel Co. v. Casey*, 262 Fed. 889, that a provision in the contract that no extras would be allowed without an understanding and written order did not prohibit the making of such an oral agreement, but was a fact to be considered by the jury. If the owner made changes in the location of the work, and failed to furnish plans for part of it, and underestimated the work of excavation, thus delaying the contractor in the performance of the contract and necessitating the doing a large portion of the work in the winter season, there was sufficient consideration for the oral contract changing the compensation, even though the owner did not specifically waive claims for damages from such delays. And if the owner misrepresented the character of the soil to be excavated, though the representations were made in good faith, that would constitute a sufficient consideration for the oral contract. Judgment for the plaintiff was therefore affirmed.

CONSTRUCTION OF CLAUSE AUTHORIZING SUSPENSION IN SEWER WORK CONTRACT

The New York Appellate Division holds, *Johnson v. New York*, 181 N. Y. Supp. 137, that under a contract for sewer work, providing that the president of the borough might suspend the work if he should deem it for the city's interest, without compensation, the president was not authorized to suspend because the city had no appropriation to pay for engineering and inspection which it was impliedly bound under the contract to furnish, since it could not be assumed that the clause was intended to authorize one of the parties to impose the result of its own default upon the other.

CONTRACTS SUITS AGAINST STATES FOR WORK ON PUBLIC BUILDINGS

The Kansas Supreme Court holds, *Heman Const. Co. v. Capper*, 182 Pac. 386, that where a construction company entered into a contract with the state for the erection of a building in connection with a state public school an action for a balance alleged to be due thereon, brought against the official board which acted for the state in the letting of the contract, namely, the board of administration of educational, charitable and correctional institutions, is a "suit against the state," and as such it is not maintainable in the absence of a positive and unequivocal statute permitting the state or its official board to

be sued. The contractor must look alone to the fund provided by the legislature to pay for the building. A statute which confers power upon a state board to institute or defend any and all proceedings necessary to protect the interests of the state is not a waiver of the state's immunity from suits at the instigation of private parties seeking to subject the state and its official boards to money judgments.

ADOPTION OF UNSIGNED SUBCONTRACT

Parties may adopt a written contract, and thus make it as binding as though formally executed by both, without signing it; therefore the Nevada Supreme Court holds, *U. S. Fidelity, etc., Co. v. Reno Electrical Works*, 183 Pac. 386, that in an action by the subcontractor on a public building against the surety on the contractor's bond, brought after complete performance by the subcontractor, the fact that the written subcontract was not signed is no defense.

RIGHT OF MATERIALMEN UNDER CONTRACTOR'S SURETY BOND

In an action by a materialman who furnished material for the construction of sanitary sewers for the city against the contractor's surety, the South Dakota Supreme Court holds, *Evans v. Howard Fire Brick Co.*, 173 N. W. 448, that a contractor building city sewers had the right for his own benefit to enter into a contract with the defendant surety under which the latter might obligate itself to pay labor and materialmen on the contractor's failure to pay them, and materialmen not named therein could accept the contract thus tendered by the insurer and become parties thereto with right of action in case of the contractor's default, and such contract would not be affected by the fact that it also indemnified the city against laborers' and materialmen's claims. Where a contractor has expressly agreed to pay all claims for labor and materials and his guarantor binds himself to pay for such labor and materials equally with the contractor, laborers and materialmen may adopt such guaranty and enforce it as if it were made directly to them.

COUNTY SUPERINTENDENT OF CONSTRUCTION AS WITNESS—COSTS WHERE CLAIM IS EXCESSIVE

In an action by a subcontractor for the amount claimed to be due from the principal contractor as well as an amount claimed for extras, the general contract being with a county for the construction of a courthouse, it was held, *Weiffenbach v. Puget Sound Bridge & Dredging Co.*, Washington Supreme Court, 184 Pac. 321, that the superintendent of construction for the county was a competent witness as to the amount and reasonable value of the extras, even though his determination might not be conclusive. Where such an action is equitable in its nature and costs should be apportioned under equitable rules, the assessment of costs against the subcontractor was held warranted though he recovered a substantial amount, where his claim was grossly excessive, particularly where there was no dispute as to the amount actually recovered.

NEWS OF THE SOCIETIES

July 6-8.—CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS OF THE STATE OF NEW YORK. Annual conference, Jamestown, N. Y. Secretary, William P. Capes, 25 Washington avenue, Albany, N. Y.

July 26-30.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Toronto, Canada. Secretary, Stephen E. Hoey, Municipal Bldg., New York.

Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATION. San Francisco. Office of secretary.

Sept. 7-10.—NEW ENGLAND WATER WORKS ASSOCIATION. Annual convention, Holyoke, Mass. Secretary, Frank J. Gifford, 715 Tremont Temple, Boston, Mass.

Sept. 13-17.—AMERICAN PUBLIC HEALTH ASSOCIATION. Boston, Massachusetts.

Sept. 13-17.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual convention, San Francisco, Cal.

Sept. 13-17.—SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, St. Charles Hotel, New Orleans, La. Secretary, E. L. Fulkerson, Waco, Texas.

Sept. 20-23.—SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, St. Charles Hotel, New Orleans, La. Secretary, E. L. Fulkerson, Waco, Texas.

Oct. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 401 Lincoln Avenue, Valparaiso, Ind.

BUFFALO ENGINEERS IN CHAMBER OF COMMERCE

Buffalo engineers and architects have formed an auxiliary organization to co-operate with the Chamber of Commerce in the engineering and industrial development of Buffalo.

THE ENGINEERING SOCIETY OF WESTERN MASSACHUSETTS

Engineering Society of Western Massachusetts held its first annual meeting at Springfield, May 10, and elected C. D. Chesney, president.

CANTON ENGINEERS' CLUB

An engineers' club has been formed at Canton, Ohio, and has already enrolled more than a hundred members and has elected E. J. Landor of Nebraska as president and H. B. Waha, secretary.

TERMINAL ENGINEERS

The society of terminal engineers, New York City, in its recent election of officers for the coming year, has made president, John Meigs; vice-presidents, E. A. Lee, Calvin Tompkins, C. W. Baker, M. W. Williams and R. H. McLain; for secretary, J. H. Leonard, 20 Vesey street, New York.

THE WESTERN SOCIETY OF ENGINEERS

The practice of making occasional excursions to out-of-town points that has for several years been dis-

continued, was recently resumed by the Western Society of Engineers, who on May 28 visited the Forest Products Laboratory, the university of Wisconsin, State Capital and the Gisholt Machine Company at Madison, Wis.

THE STATE SANITARY ENGINEERS' ASSOCIATION

This association, organized last fall, met in Washington, D. C., May 23-27.

THE UTAH SOCIETY OF ENGINEERS

At the recent annual meeting there were elected the following officers: H. T. Plumb, president; Leroy M. Pharis and E. H. Beckstrand as vice-presidents; W. E. Turner, secretary, and R. K. Brown, treasurer.

AMERICAN ASSOCIATION OF ENGINEERS

The Washington Assembly of the A. A. E. was organized at Tacoma on May 22 by representatives of the Aberdeen, Bellingham, Everett, Olympia, Seattle, Spokane and Tacoma chapters. Representatives were also present from Anacortes, Chehalis and Walla Walla. It was decided to arrange for the Pacific Builder and Engineer as the official organ of the assembly.

E. T. Tannatt, of Tacoma, addressed the meeting on laws relative to county engineers. A committee was appointed to present at the next meeting suggestion for the revision of such laws. The next meeting will be held at Everett, Wash., on August 24.

The first annual meeting of the Nebraska Assembly of the A. A. E. was held in Lincoln, Neb., on May 29. There were elected: President, W. R. McKeen; first vice-president, Prof. Clark E. Mickey, Roy N. Toll, city commissioner, Omaha; treasurer, George W. Bates city engineer, Lincoln, Neb.; secretary, Watson Townsend, assistant engineer, U. P. R. R., Omaha.

At the June 16th meeting of the Indianapolis Chapter, the usual noon luncheon was served in the Chamber of Commerce Building and an address was made by Prof. C. F. Arding of Purdue University recommending that the association cooperate with the American Federation of Engineers on a conservative platform. The resolution on open specifications was discussed and referred to the ethics committee.

From the national headquarters of the association, a circular letter has recently been sent to 93 deans of engineering colleges asking for comment on the proposed schedule of salaries

recommended for educators and which varies from a minimum of \$1,800 per year for an assistant instructor, to a maximum of \$15,000 for the dean, director or superintendent reporting directly to the president of the institution.

LOUISIANA ENGINEERING SOCIETY

New Orleans, June 2, 1920.

At a regular meeting of the Society, held in the Lafayette Theatre, June 4, there was presented an illustrated lecture by Mr. W. M. White, manager of the hydraulic department of Allis-Chalmers Company.

NATIONAL ADVISORY HIGHWAY BOARD APPOINTED

The U. S. Secretary of Agriculture has appointed as members of the Advisory Highway Board: Paul D. Sargent, chief engineer, State Highway Commission, Augusta, Me.; Joseph Hyde Pratt, secretary, American Association of State Highway Officials, Chapel Hill, N. C.; George E. Johnson, state engineer, Department of Public Works, Lincoln, Neb.; W. G. Thompson, state highway engineer, Trenton, N. J.; Ira R. Browning, state road engineer, Salt Lake City, Utah; W. D. Uhler, chief engineer, State Highway Commission, Harrisburg, Pa.; C. J. Bennett, state highway commissioner, Hartford, Conn.; A. B. Fletcher, state highway engineer, Sacramento, Cal.; W. R. Neel, state highway engineer, Atlanta, Ga.; W. S. Keller, state highway engineer, Montgomery, Ala.; Geo. P. Coleman, state highway commissioner, Richmond, Va.; S. E. Bradt, superintendent of highways, Springfield, Ill.

At the first meeting, in Washington, D. C., June 4 and 5, the board discussed the general principles governing the formation of the national highway policy.

KENTUCKY GOOD ROADS ASSOCIATION AND KENTUCKY STATE ROAD ENGINEERS' ASSOCIATION

There was held in Louisville, Ky., on June 15th, 16th and 17th, a convention of Kentucky State Road Engineers, as well as the Kentucky Highway Association, County Judges, members of the Fiscal Courts of the State and all allied Good Road interests.

Coming at an opportune time when the new Kentucky Road Law is about to go into effect, under which there will be spent by the State Highway Department more than \$4,000,000, it was one of the greatest Good Road meetings ever held in the State.

The Minnesota Joint Engineering Board has recommended the appointment of Francis C. Shenehon, consulting engineer, of Minneapolis, to the vacancy in the membership of the International Joint Commission.

THE FEDERATED AMERICAN ENGINEERING SOCIETY

The Federated American Engineering Societies, an organization to be composed of national, regional and local societies, was organized at Washington, D. C., June 3 and 4, to further public welfare wherever technical engineering and engineering experience are involved; and to consider and act upon matters of common concern to the engineering public and their allied professions.

The action taken by the representatives at the organizing conference must yet be ratified by the societies which sent delegates and applications for membership must be received and accepted to establish the Federation. Individual memberships are not now announced, although the constitution may be construed to include the admission of individuals. Funds will be provided by contributions from the member societies of \$1.00 and \$1.50 a year per member, from local societies and from national societies, respectively. These funds may not be used by the local organizations or by the state councils which are provided by the constitution.

Direction is by an American Engineering Council meeting annually, to which member societies will send delegates in proportion to their memberships. An executive board of thirty members is provided, meeting monthly, to direct activities throughout the year. The officers of the council consist of a president, four vice-presidents, a treasurer and an executive secretary.

AMERICAN SOCIETY OF CIVIL ENGINEERS

At the June 2nd meeting Charles Evan Fowler presented a paper on the Revision of the Niagara Railway Arch Bridge, illustrated by lantern slides. It described work accomplished in 1918-19, and included a complete investigation of live loads for railway bridges, strain-gauge studies and a new strain gauge, special toggle for jacking apart the top chords for the readjustment of stresses in members, unit stresses and a logical column formula, methods of reinforcing the floor system abutments, etc.

OKLAHOMA ENGINEERS' ASSOCIATION

A state association of members of the American Society of Civil Engineers has been organized for Oklahoma with H. B. Hinckley, president, and E. S. Alderman, C. M. Pritchard, E. M. Graham, F. D. Brown, H. F. Layton, and M. L. Cunningham as vice-president, and F. H. Craddock as secretary.

SAN FRANCISCO ENGINEERING ASSOCIATION

The San Francisco section of the American Society of Civil Engineers at the meeting of June 8, had a large attendance and papers on, The Causes of and Problems of Increased Salinity in San Pablo and Suisun Bays, on Teredo Attacks on Piles that have been immune for 50 years, and on What Increased Salinity Means to Irrigation and Water Systems, were presented and discussion on them was led by 12 members previously prepared to make four minute speeches.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

After a two-day meeting at the office of the Bureau of Public Roads, Washington, D. C., the executive committee of this association recommended the acceptance by the U. S. of the invitation to become a member of the permanent international association of road congresses and to invite the association to hold its next meeting in the United States.

The United States is now the only civilized country not a member of the international road congress and membership in it is strongly recommended by T. H. MacDonald, chief of the Bureau of Public Roads.

GOOD ROADS CONGRESS

The seventh annual good roads congress at Winnipeg, Canada, was attended by more than 200 delegates including a large number from the United States and a strong sentiment was manifested for improved cooperation between educational, technical and civic bodies interested in highway construction and maintenance.

NATIONAL HIGHWAY TRAFFIC ASSOCIATION

The recently published proceedings of the annual convention, held last January, of the National Highway Traffic Association, the Highway Transport Conference, and the National Automobile Chamber of Commerce, contain considerable interesting and valuable data including the report of the committee on highway transportation franchises, on inter-relationship of highway, railway and waterway transport, and papers on the effect of Car Tracks on Traffic Capacity of Roadways by Geo. W. Tillson, Taking an Interest in Motor-truck Legislation by Harry Meixell, Value of Highway Transport Surveys by F. Van G. Lane, Inter-relationship of Highway Transports and Back to the Farm Movement by S. B. Norton, Relation of Highways to Motor Truck Operating Cost by Arthur H. Blanchard, and Constructing Roads for Motor Truck Traffic by T. R. Agg.

The report is published by the National Automobile Chamber of Commerce, Inc., Marlin-Rockwell Bldg., Madison Avenue and 46th Street, New York City.

THE NEW JERSEY STATE ASSOCIATION OF COUNTY ENGINEERS

This association held its quarterly meeting at Hotel Mannahasset, Seaside Park, New Jersey, June 25 and 26. H. F. Harris, Secretary, Mercer County Court House, Trenton, N. J.

NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES

Pursuant to a call from the managing director of the federation, a meeting was held in Philadelphia, June 17, of construction associations to confer together and discuss the problems immediately confronting the industry with Ernest T. Trigg, president of the federation, and S. T. Miller, vice-president, who is serving as expert adviser to the senate special committee, which has the power of subpoena and is expected to call representatives of the construction associations into conference. As the attitude and pur-

pose of the senate special committee is wholly one of helpfulness and benefit to the construction industry and to the public, it was desired to afford every possible assistance to it. This preliminary group conference was therefore considered essential and to better serve the purpose than individual conferences in anticipation of the subpoenas.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The 36th annual convention to be held at the Greenbrier, White Sulphur Springs, West Virginia, June 29-July 2, will include six business and technical sessions at which there are scheduled for presentation, 38 papers, including four on protective devices and 19 on electric welding and power factors.

The entertainment of the delegates is amply provided for by golf and tennis tournaments, baseball games, piano recital and dancing, informal reception, a ladies' bridge and tournament, and numerous automobile drives for large and small parties.

AMERICAN SOCIETY OF CIVIL ENGINEERS' CONVENTION

The 50th annual convention of the American Society of Civil Engineers will be held in Portland, Oregon, Aug. 10-12, under the direction of D. C. Henny, chairman, Chas. B. Marx and Herbert C. Crocker, committee of arrangement of the board of direction, and a local committee of 16 members headed by Geo. P. Mason, chairman.

The headquarters of the society and the secretary's office will be at the Multnomah Hotel which has facilities for the accommodation of all the delegates to the convention. Contrary to the precedents of many previous years, no special railroad rates are made for this convention, and the announcement circulars state that the traffic is so heavy this season that members are urged to make their reservations as early as possible. The preliminary program announces the opening of the convention at 10 a. m. Tuesday, August 10, by the annual address of President Arthur P. Davis and an automobile ride to the ladies entertained by the Waverley County Club in the afternoon when there will also be a business meeting. In the evening there will be a reception by the local membership and on Wednesday, August 11, there will be in the morning an automobile trip over the Columbia Highway to Eagle Creek returning by boat in the afternoon in time for an evening smoker at the hotel.

Thursday the 12th may be devoted to a trip to one of the logging camps for the inspection of the modern large scale methods used in timber production in the northwest.

PROBLEMS THAT CITIES ARE STUDYING WITH EXPERTS

The Kansas City Engineers' Club has appointed F. W. Fratt, manager of the Eclipse Valve Company, as chairman of the Civic Sanitation Committee, which will first take up the problem of water supply.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

RANSOME NEW CONCRETE PAVER

Designs have been for some time substantially completed for the Ransome Concrete Machinery Company's new paving machine, that has been built and operated for a considerable time in order to permit continued observation and the modification of any details which it appeared could possibly be changed in order to give smoother or more convenient action or greater durability requisite for the most perfect machine that it is possible to construct for the required purposes.

A great deal of time and pains have therefore been spent in giving extra value to a machine intended to satisfy all requirements, under all conditions, and even to be superior to neglect and abuse so as to provide a reliable plant the year around for continuous or intermittent service even when handled by inexperienced operators, and to involve minimum expense for maintenance, repairs or renewals.

The machine, which weighs complete about 22,000 pounds, has a horizontal boom 20 feet long elevated about 6 feet above the ground, and exclusive of it, is 11½ feet long, 13 feet high over all and 9 feet wide when the detachable platforms are removed.

It has a capacity for 21 feet of mixed concrete that can be turned out well mixed at the rate of 1 batch in 1½ minutes or less. It is mounted on a very stiff steel frame with crawler traction enabling it to propel itself forward or back at the rate of ½ mile per hour. It is equipped with a standard 21 S. Ransome mixer drum and extra large bottom dump bucket

designed to receive the concrete in the center of the bucket, which is an important feature for dry concrete.

The traverse of the bucket back and forth on the boom is controlled by a single lever and as soon as the bucket starts to move back towards the mixer a trigger commanding the links from the bottom flaps, is automatically operated to dump the contents of the bucket without requiring any attention except from the man who directs all the operations of the machine from a platform about 6 feet long. At one end of this platform are grouped the handle that controls the water tank discharge and the four levers that control the reverse gear and clutches for the tractor and the drums operating the charging hopper and a small swinging crane alongside that unloads the sand, gravel and cement if necessary and empties them into the hopper.

All of the principal journals have Hyatt roller bearings and all of the gears are enclosed for safety.

Although the maximum effort (when the charging hopper is being elevated) only requires 9 h.p. the machine is provided with a standard 14 h.p. engine specially balanced to avoid vibration and provided with sight oil cups and enclosed in a dust-proof case. Steam is produced in a 16 h.p. boiler and there is a 2½x6 foot cantilever platform available for fuel or water tanks, storage or other purposes.

The time of mix is controlled by a special meter that locks the discharge chute until the drum has made any fixed number of revolutions when it automatically unlocks the chute and rings a bell. Filling the drum resets the meter for the next batch.

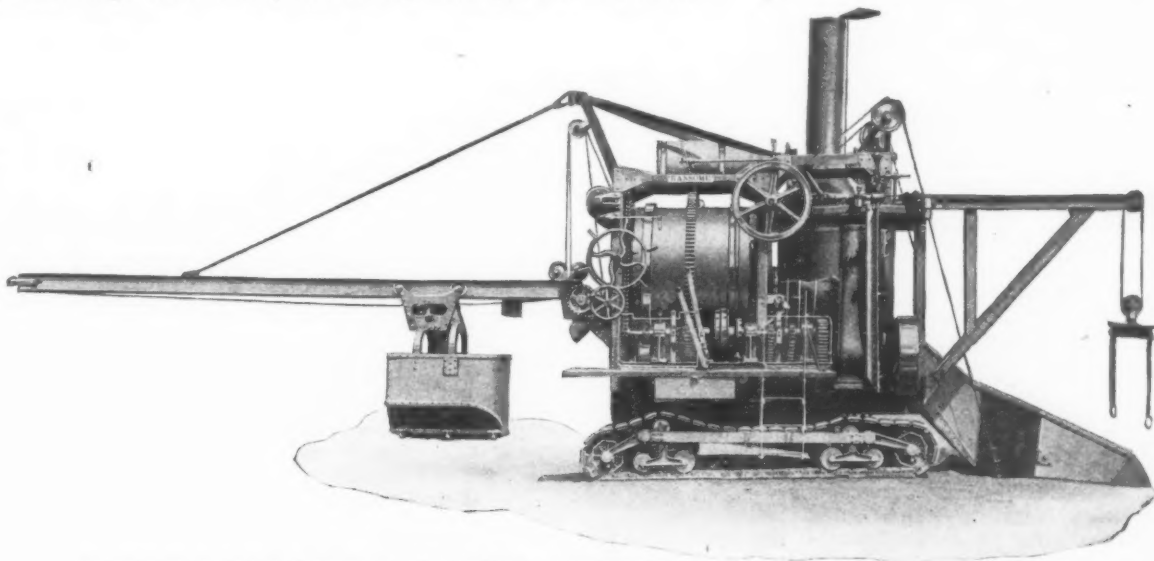
At the opposite end of the operator's platform there are located one lever for loading the mixer, one lever to start and stop the drum, a wheel for discharging the mixer into the bucket, and a lever to control the movement of the bucket on the boom which is so easy that the empty bucket has been blown back and forth by the wind.

Canvas curtains provide a neat and attractive roof and windshield over the operator's platform. They are attached to a light steel framework and adjusted to give an unrestricted opening or such protection as he may desire from sun, wind and rain.

PATTERSON MIXING MACHINE

The Paterson type "E" mixer manufactured by the Paterson Foundry & Machine Company has a wide range of usefulness and is claimed to be almost indispensable for mixing liquid chemicals, rubber, paint, varnish, glue, oils, and clay, and is built in several sizes both plain and with steam jackets

They ordinarily have a tight cylindrical steel tank of rigid construction with heavy stirring mechanism mounted on top and provided with suitable stirrers which, in sizes 0 and 1, are of cast iron and in the larger sizes are of steel. They can be furnished with wooden or cast iron tanks and with duplex mixing devices rotating in opposite directions. The standard sizes of plain mixers have tanks 15 to 72 inches in diameter with capacities of 11 to 1269 gallons. The jacketed mixers are made with diameters of 24 to 72 inches and capacities of 47 to 1269 gallons.



CONCRETE PAVING MACHINE, 1920 MODEL, WITH CRAWLER TRACTION AND BATCH METER

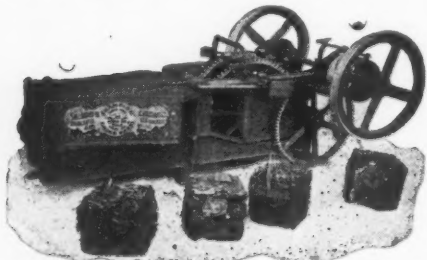
HAND POWER BALING PRESSES

The Famous Manufacturing Company is the maker of portable hand power presses for baling various bulky materials and has put on the market several styles and sizes specially adapted for waste paper and for sheet metal scraps. The former is made in six sizes, weighing from 150 to 550 pounds, and producing a bale from 150 to 350 pounds. It is made of sheet steel and the plunger is driven by a rack and pinion actuated by a ratchet lever that can be operated by a boy.



HAND POWER PRESS FOR BALING PAPER, RAGS, ETC.

The sheet metal scrap busheling press is power driven, weighs 3,500 pounds, and occupies a 5 x 8 foot floor space. The plunger is operated by a double-gear toggle driven by a heavy fly wheel. The scrap is shoveled into the hopper, the lid closed,



POWER DRIVEN BUSHELING MACHINE FOR SHEET AND SCRAP METAL

and in 10 seconds all kinds of sheet metal scraps, shear trimmings, metal chips, punching wire, tin cans, and other sorts of scrap are compacted into a 15 x 15 x 15 inch bale weighing from 30 to 60 pounds. The machine is operated by about 5 h.p., and with one man can turn out from 3 to 5 tons product per day and with two men from 10 to 12 tons daily.

INDUSTRIAL NOTES

The city of Chattanooga has purchased from the Kinney Manufacturing Company a standard 800-gallon Kinney Auto Heater and Distributor, and mounted on a separate sub frame and interchangeable with the oiler equipment on the same truck chassis,

a 1,000-gallon tank with bronze lined pump, flusher nozzles and sprinkler heads. This combined equipment cost \$5,000 over the cost of complete units for this class of work, and is considered a worth while combination for many cities which do not have enough hauling work to keep this equipment busy a large part of the summer.

LOCK JOINT CONCRETE PIPE CO.

Lock Joint Pipe Co. is constructing 10 miles of 54-in. water pipe for the City of Denver, and they also are constructing 8,000 feet of 48-in. reinforced concrete pipe (pressure) for the City of Kansas City, Mo., in both cases building the pipe at the site of the work.

The Lock Joint Pipe Co. is at present operation plants in the following states: New York, New Jersey, Pennsylvania, Virginia, Louisiana, Missouri, Kansas, Oklahoma, Colorado, Utah, Montana and Ontario, Canada, these operations covering construction that cannot be handled from the head manufacturing plant at Ampere, N. J.

KENNEDY VALVE MFG. CO.

The Kennedy Valve Manufacturing Company of Elmira, New York, announces the removal of its New York office and warehouse to 95 John street and advises its patrons that there will be kept there in stock large quantities of the most popular sizes and types of Kennedy valves ready for immediate delivery.

The company also announces that J. S. Hanlon will be the New York representative, and that C. H. Kennedy has been made the general sales-manager.

AMERICAN PLANT ABROAD

In order to maintain sufficient depth of water in the Whangpoo River at Shanghai where there is a vast amount of commercial navigation, the Standard Oil Company has installed there a dredge equipped with a clamshell bucket operated by an 80-foot derrick boom and an American hoisting engine. When not employed in dredging, the steel barge and derrick are available for handling freight.

PERSONALS

Stillwell, Howard, has been appointed city manager of Sumter, S. C.

Bien, Morris, has been appointed assistant director of the U. S. Reclamation Service.

Williams, J. D., has been appointed city engineer of New Britain, Conn.

Hilscher, Ralph, has been appointed director of the Bureau of Sanitary Engineering of the California State Board of Health.

Richan, G. F., has been appointed junior hydraulic engineer of the Canadian Reclamation Service.

Green, Roy M., professor of highway engineering at the Agricultural and Mechanical College of Texas, has resigned that to become president and manager of the Western Laboratories at Lincoln, Nebraska. Western Laboratories will take over the consulting

and testing practice of Clark E. Mickey, of Lincoln, Neb., and will specialize in the testing and inspection of all kinds of building materials and operations.

The Kansas City Engineers' Club has appointed F. W. Fratt, manager of the Eclipse Valve Company, as chairman of the Civic Sanitation Committee, which will first take up the problem of water supply.

Van Duyn, J. R., since 1912 division engineer of the Passaic Valley Sewerage Commission, has been promoted to chief engineer of construction at a salary of \$6,000, succeeding the late William M. Brown, recently deceased.

Easter, J. B., has been appointed district engineer of the 6th State Road District of New Mexico.

Moorfield, Chas. M., has been appointed chief engineer of the South Carolina State Hwy. Department.

Gabriels, Henry E., has been appointed city manager of Watervliet, N. Y.

Spelman, J. R., has been appointed assistant consulting and resident engineer for the preparation of plans, specifications and supervision of construction for the Long Beach bridge, Nassau County, N. Y.

Macksey, H. V., has been appointed superintendent of public works, Framingham, Mass.

Miller, F. F., has been appointed city engineer, New Castle, Pa.

Lynt, R. K., has been assigned to service on topographic mapping of Admiralty Island for the U. S. Geographical Survey.

Gray, B. E., has been appointed senior highway engineer of West Virginia.

Wells, Wm., has been appointed to investigate the water supply of Rensselaer, N. Y.

Mackie, G. D., has been appointed to represent the city of Moose Jaw, Sask., on the Saskatchewan Water Supply Advisory Council.

O'Dell, DeWitt, has been appointed assistant engineer in the State Engineer's Department, Rochester, N. Y.

Kyle, C. K., has been appointed comptroller of the Pennsylvania State Highway Department.

Custance, A. M., resident engineer of the Massachusetts State Highway Commission, has been appointed superintendent of water, streets and sewers, Hudson, Mass.

Flory, Samuel, founder and general manager of the S. Flory Manufacturing Co., died recently at Bangor, Pa.

Parmer, Claude, vice-president of the Kuert Contracting Co, died recently in Indianapolis.

GOETHALS, WELLS & CO.

The general engineering and construction firm of Goethals, Wells & Co., 150 Nassau St., New York, has been formed, with Major-General G. W. Goethals, president, George M. Wells, Henry Goldmark and James L. Ward, vice-presidents. The firm will specialize in engineering and architectural design and construction.